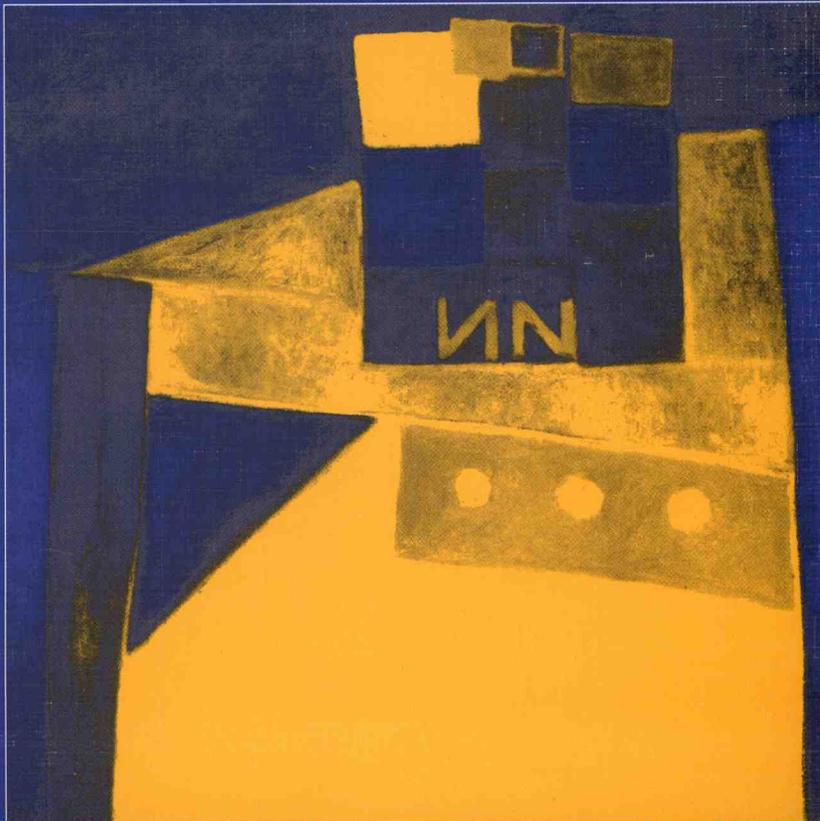


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# Priorities in collective health research in Latin America

*Delia M. Sánchez, Roberto Bazzani, Silvio Gómez*  
(editors)



**GEOPS**  
Grupo de Estudios en  
Economía, Organización  
y Políticas Sociales

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HEALTH RESEARCH  
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**GEOPS**

**Study Group on Economics, Organization and Social Policies**

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# INTRODUCTION

The project Health Research in Latin America: a Horizon, arose from the joint interest of the International Development Research Centre of Canada (IDRC), particularly the former Director of the Latin American Regional Office, Tony Tillet and the health program officer, Dr. Silvio Gómez, and GEOPS (Grupo de Estudios de Economía, Organización y Políticas Sociales), to have a Latin American formulation of the main health problems and research subjects in collective health for the coming 20 years.

The work was coordinated by GEOPS, with the collaboration of IDRC.

Differently from what is the usual rule in the latter agency, its role was not limited to that of a funding agency, but its experts took an active part in the design and development of this project.

It was also supported by the Pan American Health Organization (PAHO), through the Director of the Research Coordination and Technologic Development Unit, Dr. Alberto Pellegrini Filho, and the people he contracted, and by the Commission on Health Research for Development (COHRED), which co-financed the printing and dissemination of results.

The call to take part in the exercise was based on the knowledge that the members of the coordinating group had on the fields of work and excellency of those who finally participated in the team. It was formed by Drs. Jaime Arias, Roberto Belmar, Moisés Goldbaum, Alberto Pellegrini Filho, Jaime Sepúlveda Amor and Francisco José Yepes, besides Drs. Silvio Gómez and Roberto Bazzani from IDRC and Dr. Delia Sánchez, who coordinated the project in GEOPS. Other authors participated upon request of the before-mentioned in the elaboration of some papers.

Participation was individual, not institutional, and we intended that despite the budgetary constraints, there could be a diversity of geographical areas, fields of interest and political visions, so as to enrich the common analysis.

Why should we stress research now, when health problems seem to be so urgent and the resources to solve them seem so limited? It might seem better to invest in something whose efficacy we already know, even

partially. We agree with the statement of the Commission on Health Research for Development when it says that "Research is essential today because we need its results now in order to empower those who must achieve more with less resources". (COHRED, 1990)

We know that the same Commission has made a most important effort in the same line that we mean to follow: to create the conditions so that countries may define priorities in health research.

Because of the global composition of the committee that drew them, its proposals, summed up in the concept of Essential National Health Research are not "tailor made" for any particular region, and work must proceed to adjust them to different realities. That is precisely what this project was about.

On the other hand, the option to concentrate in the subject of collective health, leaving aside biomedical and clinical research, was due to the fact that we think that the former is the one related more directly to population health, which is our interest, and as has already been shown, it is the least abundant in the region, despite the need for it. (Pellegrini, 1993)

This work is directed both to health researchers in our Continent and to policy makers in the field of research, be that governmental agencies, universities or international organizations for the promotion of research.

The objective was to identify the main challenges to collective health research in Latin America for the coming 20 years as well as the consequences that the more likely scenarios will have on the collective health research policies at the country level.

The Latin American population is heterogeneous enough to make us think that the idea of setting priorities for the region as a whole is a naive effort, more so when at the same time we try to reach a proper identification of the health status and risks of different sub-groups within each country, and to design focalization strategies for the delivery of care that better suits that diversity. Even so, socially relevant research lines for the continent do have much in common, although solutions derived from them may be implemented differently between and within countries.

Problems related to social development and economic growth are also comparable, and the issue of training and permanence of qualified human resources in research has not been solved in any of our countries.

Both Juan César García (1982) and Alberto Pellegrini, (PAHO, 1992, Pellegrini, 1994) point out that the study of scientific production in Latin America is confronted by the weakness of the existing information systems. This is not just a result of the lack of systematization and development of information, but of the dominant concept in the preparation of scientific indicators. It is based in an input-output model, which mechanically links resources to products, (be they scientific papers, patents, etc.) not considering the process of production, dissemination and utilization of knowledge, or the social environment where it occurs.

According to the data gathered by Pellegrini (op.cit.) the amount of Latin American scientific production is almost meaningless (0.97% of all published papers).

On the other hand, that scarce production is concentrated in a limited number of countries in Latin America. Argentina, Brazil, Mexico and Venezuela contributed that year 73.8% of scientific papers from the region, and 78.6% in 1984.

Scientific production on health meant 55% of the whole in the period 1972-82, yet that percentage shows a negative trend: it starts out at 60% in the previous period and ends up in 42%. The author points out that papers on public health subjects represent only 1.6 to 10.8% of scientific production on health in the countries under study.

Existing information for diagnosis is relatively good, particularly after the appearance of PAHO's "Health Research in Latin America" (PAHO, 1992), although there is still a problem with the adequacy of indicators, which had already been pointed out, among others, by J.C. Garcia in his pioneer work during the early 80's. We still miss the knowledge of what is happening in those countries with an ever smaller production, which were not included in the publication we are mentioning due precisely to that fact, and because of the methodology used, the work that might be carried out outside what we might call "the establishment", which, though presumably smaller in quantity, might be important in quality and the exploration of new lines of thought.

Based on this already existing initial diagnosis, the next step seemed to be about the future: where do we think the frontier of health research will be by the year 2015, what will be the research capacity in Latin America and what impact might research, (both local and from elsewhere) have on the health status of our peoples. We did not mean to study the state of health research in Latin America, *but the prospective study of subject areas that were of interest for health research in the coming decades.*

This is not the first list of research priorities in the literature; quite on the contrary, there are different lists.

The Commission on Health Research for Development identifies Essential National Health Research, with a component that is specific for each country, and one relative to "global problems". Its recommendations prioritize the following:

"- two successful programs, TDR (Special Program for Research and Training in Tropical Diseases) and HRP (Special Program for Research, Development and Training in Human Reproduction)

- to continue supporting two programs on diarrhoea, CDD and ICDDR,B.

- to carry out research on acute respiratory infections, stressing simple and effective treatments.

- to establish a research and action program on better methods for the detection, out-patient treatment and prevention of TB,

- to carry out research supporting national programs for the eradication of micronutrient deficiency, particularly vitamin A, iron and iodine,
- to research in order to identify modifiable factors to prevent the high risk of diabetes, coronary disease and hypertension associated to the epidemiologic transition,
- to design and assess interventions in the field of behavior to reduce wounds, sexually transmitted disease and substance abuse,
- to expand international collaboration in mental health problems, with a stress in diagnostic methods and management of highly prevalent tractable diseases, and
- to establish international research networks in the most important areas of environmental and occupational health."

Pellegrini (1994), addressing the argument from the point of view of priority problems, points out to "those problems deriving from the epidemiologic and demographic transition, the relationship between a change in living conditions and its impact on health, the political and economic implications of decentralization and privatization of services, and the mastery of new technologies."

Nevertheless, in the same paper, but starting from the strategic importance of some areas, he says that "To foster and orient in a realistic fashion the development of such areas as biotechnology, molecular pharmacology, immunogenetics, health economics and sociology, and several others, is thus a necessary requirement of all health S & T policy in any society". In a previous paper, (Pellegrini, 1993), the same author stresses the relevance of knowing the situation and trends of scientific activity, for which "there is a need for reliable information, adequate indicators and critical studies." This need had already been pointed out by J.C. García and other authors previously, but the same problems remain .

The World Bank (1993) identifies those problems derived from the demographic and epidemiologic transition, with the coexistence of pathologies related to different stages of the transition process, and those of organization, management and alternative financing of health services, as priority. If we add to that the Bank's proposal of a "basic basket" of health services that should be equally accessible to the whole population, and that is specific to each country's health conditions and socio-economic development, it will need an important contribution from research to be defined. In case the model that this institution proposes is applied, it will have to be carefully monitored regarding its effects, so that we would have a new list of research priorities.

The Economic Commission for Latin America and the Caribbean (CEPAL), mentions the following health problems " The variations in the demographic structure, the decrease in infant mortality and the processes of urbanization and industrialization,... cancer, cardiovascular diseases, accidents and the consequences of violence, as well as perinatal problems,

...chronic degenerative diseases, mental disorders, alcohol, tobacco and drug addiction,... and the world wide epidemics of AIDS." Since the paper makes special emphasis in equity, focused health services, oriented towards the social groups at higher risk, are also identified as a relevant problem.

The differences in the conclusions may be largely accounted for by the various methodologies used by the authors.

The World Bank methodology deserves special interest due to the development of the DALY indicator (disability adjusted life years), but due to the lack of reliable statistical information on morbidity and disability, it ends up relying on expert opinions, requesting them to estimate those values on which the methodology is later supported. On the other hand, the weight of the value assigned to the years of life presented in the document is highly questionable, and the authors themselves explicitly pose this problem, so that it may not be said that the methodologies for priority setting, both in research and the delivery of health care, are an irrelevant or already solved subject.

This is why we chose a methodology of prospective analysis, based on the consensus of experts who identified great social trends, their possible consequences on health and health services, and the gaps of knowledge. We preferred to stress an approach oriented towards the conditionants and determinants of disease, rather than an exhaustive list of illnesses.

This methodology assumes also the explicitation of certain minimum values, since the identification of more desirable futures is precisely that: it means to choose a wanted scenario and to look for the ways to reach it, in contrast with an attitude that simply describes reality and "counts the casualties".

The specificity of the work carried out by the group laid, in our mind, in the incorporation of the criterion of possible and likely futures, so that, on top of considering indicators which by definition point to the past, societal trends could also be considered in order to imagine what health problems will affect the population in a near future. If we believe that human history is more than a monotonous repetition of the same facts in different places and times, we may not assume that health will, so that we do not think it is valid to only look at the past in order to determine what to do in the future.

Several shortcomings may be pointed out in the methodology as used in this exercise, particularly the fact that all participants were public health physicians. Although other disciplines were present in the bibliography, they were not in the discussions, which, among other reasons, was due to a budget constraint.

Even so, if we admit the physician configuration, particularly oriented to collective health disciplines, we must still point to some absences, such as the discussion of the future of communicable diseases. We were fully aware of this omission, since, not meaning to argue their importance

at the present time and probably also in the near future we are concerned with, it was felt that there is greater knowledge on the research needs in this field, which does not mean to say, of course, that there is enough funding or that research is actually being carried out. We did stress, on the other hand, the need to study some of their determinants, such as poverty and lifestyles.

It was in this context that a group of experts in different fields of collective health was convened to work together, in a workshop, trying to imagine what the future will be like based upon present social trends. This methodology considers health as a social fact, not isolated or independent, and tries to go from macro to micro, up to the identification of the niches of ignorance, which will be the future areas of research. We think of research in collective health as socially relevant, responding to real problems, and ideally, being a step ahead of their emergence.

Once the group was formed, a meeting was held in Montevideo, on July 1995, where a background paper prepared by the coordinator team was discussed and a list of priority subjects was defined. In order to identify these subjects, a consensus methodology was utilized, with the identification in successive rounds of the main epidemiologic and social trends in the region, and, from them, the foreseeable challenges in the area of collective health for the coming twenty years.

These trends, subdivided into societal, political and technologic and health sector factors, were the following:

Societal and natural conditionant factors:

- a. demographic and epidemiologic transition
- b. environmental contamination
- c. growth of poverty and inequity
- d. phenomena related to modernity and changes in familial structure
- e. lifestyles, non healthy behavior and violence

Political and technologic general factors:

- a. opening and globalization of economies
- b. accessibility of technology
- c. improvement in the organization and management of services in general

Health sector factors:

- a. changes in the financing of health care
- b. decentralization of services
- c. increasing participation of the private sector
- d. limitations in the availability of human resources
- e. low scientific and technologic production
- f. poor administration and quality

- In turn, the criteria to assign priority to the different subjects were:
- a. morbi-mortality burden: magnitude and severity
  - b. evolution of the problems through time (trends)
  - c. social relevance
  - d. possible role as a trigger or support for the countries' development
  - e. importance to the national community
  - f. creation or existence of a critical mass of scientists in the area
  - g. possibility of obtaining solutions within a "reasonable " period
  - h. possibility of prevention
  - i. cost of the problem and its solutions

Finally, based on these trends, specific subjects were chosen for deeper analysis, both regarding the present state of knowledge, and the possible future scenarios, and the priority research lines.

This gave rise to the in-depth papers on the present state of collective health research in Latin America, health sector reform, poverty and health, environment and health, lifestyles and modernity and demographic and epidemiologic transition. The paper on advanced-age population in Mexico is a case study affected by several of the before-mentioned thematic areas.

The team gathered again twice, (Manizales, Colombia, on February 1996, and Montevideo, Uruguay on July of the same year), to discuss collectively the papers and their summaries.

The image of the region and its needs regarding collective health research so obtained, obviously has some similarities to that of other agencies or groups, but it also has many specificities.

We hope it is useful to all those who are involved in decision-making in health research. If that is so, we shall have attained our objective.

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# FUTURE CHALLENGES FOR HEALTH RESEARCH IN LATIN AMERICA (SUMMARY)

## HEALTH RESEARCH

During the nineties, new trends in the organization and development of scientific activity started in Latin America and the Caribbean. They are the result of a series of global and regional changes, both at the macroeconomic level and in the dynamics of the scientific-technologic development, to which, in the specific case of health science and technology, were also added the transformations in the demographic, morbi-mortality and service organization profiles.

The creation of governmental agencies dealing with science and technology policies, which took place in Latin America from the fifties, was based on the then prevailing idea of the State as the main agent of development. In fact, in Latin America the State has always been the main planner, financier, executor and user of the scientific-technological activity; by the mid-eighties it was accountable for approximately 80% of the resources used by the sector, while in the developed countries this share was of 40%.

Among the characteristics of the new development models that started appearing in the region we point out the economic opening, with a decrease in the importance of domestic markets in the orientation of development policies, and the reformulation of the role of the State.

The organization of the scientific-technologic activity that is coherent with that new framework cannot go on being based on central planning and State hegemony. The latter's role is now to establish stimuli and to define "the rules of the game", opening spaces and supporting institutions so that they promote the development of science and technology.

Placed in the junction of science and technology and health policies, the health scientific-technological activity is under the influence of these general determinants, to which specific sectoral changes are added: new problems deriving from the demographic and epidemiologic transition, the changes in living conditions and lifestyles of individuals and social groups, the political and economic effects of the organization and financing of health services. On the other hand, health services and

inputs, aside from their main task of contributing to improve the sanitary situation, acquire an ever growing economic and technologic dimension.

## **Science and technology in Latin America<sup>1</sup>**

The goal of earmarking 1% of the IDP to science and technology activities, established in the sixties, has never been attained in any country of the region. These expenses range from 0.24% to 0.75% of the IDP, while in the developed countries it reaches 2.7%. Most resources derive from the State.

Nevertheless, the nineties showed two new trends: the increase of enterprise participation in these expenses and the increase of external financing for technologic innovation activities. These trends are more evident in Chile and Mexico, with a significant increase in the expenses in science and technology, a growth of the private sector's share, priority for the frontier areas in the scientific-technologic development, an emphasis in technologic innovation and closer relation between research and the productive sector. Venezuela and Argentina are the countries that are further behind in this aspect.

Concerning international sources of funds, the most important ones are the IDB since the beginning of the sixties and the World Bank since 1970. Through this period, both banks have modified their financing policies several times. Nowadays, all approved projects generally include a component of studies and/or operational research, so that we may speak of an indirect support to health research. Once the projects are over, the financing institutions should check whether those resources have really been used in research.

Despite these advances, the latinamerican scientific production in health is very little in quantitative terms (it represents 1.5% of the world production) and is concentrated in few countries and in an individual approach - biomedical and clinic- despite the urgent need for studies on health situation and its determinants and on the organization of health systems and services.

In order to assess this production, a study was made considering the papers published by authors residing in Argentina, Brasil, Chile, Cuba, Mexico and Venezuela during the period 1973-1992, that were registered in the base of the Institute for Scientific Information (ISI). This base is quite selective and includes approximately 3500 journals, the most important ones in the different fields of science.

The total number of papers was 41.238, of which 38.3% were produced during the first decade, and 61.7% in the second one. The six selected countries were responsible for almost 90% of the papers registered by ISI and within this group, 28.1% come from Argentina and 32.9% from Brazil.

Only 2.7% of the papers corresponded to public health research,

while clinical research contributed 53.4% and biomedical research 43.9%. Clinical research was distributed more evenly, biomedical and public health showed a great degree of concentration in Brazil and Argentina (approximately 70% in each area). The Brazilians were responsible for 60.7% of the 1.107 papers on public health.

Finally, as a new phenomenon, there was a clear trend to decrease the number of papers published by isolated authors. This "collectivization" of production is verified not just among authors, but also among institutions and the countries they belong to.

The use of research to guide policy decisions is an important problem. During the past decade great efforts have been made to bring together research and policies, but many of them have failed because they were based on unrealistic expectations and because there was not a good understanding of the policy-making process, subject to multiple forces aside from research.

Aiming at overcoming this problem, there is a clear need to get to know better the different social actors involved in health care (politicians, entrepreneurs, clergy, consumers, professionals, researchers), as well as their sources of information, their motivations to make decisions and their counterparts, competitors and allies. Furthermore, the researcher must develop political and communication skills, besides his scientific ones, which does not contradict the need for more formal structures and mechanisms to carry out this task.

Long range institutional development and the advance of democratization of the decision-making process also play an important role to increase the use of research for policy-making. Research must be a collective voice. Well defined priorities are needed to uphold a research agenda, as well as the means to convey the results to wider audiences, and an educated population that is ready to receive them.

### **Conceptual and methodologic challenges for health research**

The Public Health field is undergoing an important epistemologic, theoretical and methodological crisis: a crisis of paradigms. A sign of this crisis is its impossibility to refer specifically to its object, health; the object of Public Health is in fact referred to "collective disease", thought of, in a partial and residual manner, as "risk and its factors".

Contemporary science has produced a series of epistemologic and methodologic elements that are grouped under the generic title of "a new paradigm". The theory of complexity is the axis that would partially unify the different contributions to this new scientific paradigm.

Synthetically, there are four key terms for the recognition of the opening to a new paradigm in Public Health: transdisciplinarity, complexity, plurality, and praxis.

At the epistemologic level, the reconstruction of Public Health means

to overcome the false oppositions that rule the problem of knowledge in its field: oppositions between theory and practice, object and context, individual and collective, individual and population, biologic and social, quantitative and qualitative, descriptive and analytical, concrete and abstract.

In a theoretical level, many authors point out the strategic importance of constructing the Public Health object. This would be part of a new family of scientific objects, built as a whole and complex object.

In the methodological sphere, finally, there are interesting possibilities for the insemination of extensive research strategies with qualitative techniques (methodologic hybridation). Furthermore, we may expect the valorization of strategies that so far lack prestige, such as ethnographic ones, while statistical inference loses value as a source of analytic legitimacy for epidemiology.

This renewal will foster new ways to conceptualize and measure health and will aid in the creation of explanatory models, aiming at the identification of "sensitive spots" where the intervention on the health situation may be increased. In order to do that it is necessary to overcome the conceptual, methodologic and technical limitations of epidemiology and social sciences applied in health, recovering their symbolic and concrete efficacy as basic disciplines in collective health.

To renew the practice of Public Health will reinforce its participation in the redefinition of organizational models and sanitary strategies in the continent. Latinamerica has already an important degree of theoretical sophistication and has acquired the methodologic potential to do it. In order to take part in this capital effort, and since chaos is no stranger to us, we need only master the technological instruments and the analytical intelligence to put Public Health ahead of the old paradigms of cause and risk.

## HEALTH TRANSITION

The epidemiologic transition theory, deriving from that of demographic transition, intends to account for the changes in health and disease patterns of populations from their demographic, economic and social dynamics. Population growth, migration from the country to the city, industrialization and urbanization, would be the direct determinants of sanitary changes.

The direction, magnitude and temporality of these changes could be considered universal. Thus, from a first stage of high mortality, where hunger and plague are the main causes of death, societies would move on to another one where communicable diseases, and then a third one where chronic-degenerative diseases prevail.

By the fifties, most industrialized countries had gone through all the

stages of this transition. A second group of countries would be completing it now, while a third group would only be starting its transitional process.

Demographic transition may be regarded as the passage from a population structure of small dimensions, low life expectancy and high mortality and birth rates, to another one of large dimensions, high life expectancy and low mortality and birth rates. When these demographic changes are translated into transformations of the health-disease profile of the population, as well as of its risk factors, we may speak of a proper epidemiologic transition process.

Nevertheless, transitions in different countries do not follow a single sequence. In some cases we may foresee that the mix of chronic and communicable diseases will last for a long time, and we then speak of a prolonged or delayed transition. When different socio-economic segments or geographical areas within the same country show different epidemiologic profiles, we speak of a polarized transition. At the same time, there is no certainty concerning the apparition or disparition of infectious diseases, nor can we rule out the occurrence of counter-transitional events, such as shown by the cholera epidemic.

Despite the diversities, the combination of the assumptions of the epidemiologic transition theory with those contributed by classic epidemiology, administration, sociology and economics, for the first time allow the health sciences to predict the sanitary future of a country.

### **The latin american transition**

Latin America is undergoing fast changes in the health profile of its population, characterized by a decrease in those pathologies associated to underdevelopment and the increase of those that are prevalent in developed countries.

General and infant mortality show a clearly descending trend, while life expectancy at birth keeps rising. The global fertility rate shows a sustained reduction. The gap between indicators of the better-off countries and those of less privileged countries tends to decrease; that is a remarkable characteristic of the latinamerican transition.

While mortality attributable to communicable diseases has decreased, the number of deaths and impairment due to chronic illness (malignant tumors, diabetes mellitus and cardiovascular diseases) and lesions have increased. Likewise, there is a reduction in the participation of the children below five years of age in general mortality, while that of people above 65 is growing.

Among the sanitary measures that have contributed to modify the morbidity and mortality profile we may mention the control of diarrhoeal disease, (intensified because of the apparition of cholera) and acute respiratory disease, as well as the important increase in vaccinations.

Nevertheless, this global epidemiologic profile shelters a heterogeneous

group of situations. The transition process is clear in the more developed areas, while infectious and communicable diseases are still the main cause of death in areas that are socially further behind. Large cities tend to be the scenario where the epidemiologic transition confronts factors that delay and polarize it.

Urbanization has been an accelerated process in the whole region for the past fifty years. The concentration of goods and services in the "development poles" has favoured the appearance of misery belts around large cities. Lacking the necessary infrastructure, these settlements are fit for the proliferation of infectious and parasitic disease. The social problems inherent to large cities are also a source of violence, alcoholism and other addictions. Besides, industrial concentration is associated to environmental pollution problems and occupational risks. While maternal mortality tends to concentrate in the rural environment and smaller size cities, teen age pregnancies appear as a health problem in the urban setting.

Trends allow us to foresee that the health system will face a growing population of elderly, handicapped and chronically ill people, with pathologies that are up to now treated with high-cost technologies and very specialized human resources. Besides, we may assume that there will be an increase of problems derived from environmental problems, drug dependency and, in general, lifestyles that characterize modernity.

Health institution profiles - that is, their programs, strategies and practices- are outlined, in essence, by three types of factors: economic and social, epidemiologic and the availability of resources. As a consequence, demographic and epidemiologic transitions generate institutional transitions.

## **The challenges**

The health system may not take long to attain some characteristics of universality, quality and cost containment, which it will have to solve jointly. Given the different transitional processes, it is necessary to establish a close contact between global development and health policies.

The main challenge is to reach all social groups in all regions, following a criterion of equity, understood as a permanent mechanism of redistribution of social opportunities. A universal basket of services - clinical and public health\_ may be a first tool for the equitable distribution of resources.

The post-transitional epidemiologic profile translates into a new type of demand for services. In general terms, it is a late, multidrug, technologically dependent care, requiring specialists at the second and third levels of care, and an almost constant follow-up. Obviously, this is costly care, both for the institutions and countries.

As a consequence, health systems are urged to strengthen the

preventive features of their services, developing actions geared towards the timely diagnosis and detection of chronic-degenerative diseases, fostering the optimal use of first level health services and promoting activities with the goal of changing lifestyles.

Health services must be complemented by information, education and communication programs. Several chronic-degenerative diseases, as well as maternal mortality, increase in an inverse relation to schooling. So that health campaigns may be more efficacious, it is necessary to improve the educational level, above all to diminish illiteracy in the population above 15 years of age, particularly in women of child-bearing age.

It is also necessary to tend towards decentralization, promoting the consolidation of local health services (SILOS), and thus open the road of health to a greater participation of the social and private sector for the co-financing of services.

The general trend to the increase in the number of the elderly and handicapped means, besides a wide infrastructure of medical and hospital services, the creation of a social support network.

The training of human resources shall have to be adapted to the new sanitary needs of the countries and to the changes that they will bring about in the structure, organization and function of services.

In the definition of the direction of these transformations, the contribution of research is necessary for the estimation of risks, the identification of cost-effective interventions and strategy design.

## LIFESTYLES AND HEALTH

In the regional and world medical-epidemiologic literature we see an increase in the papers that mean to quantify and qualify the individual and collective relation between lifestyles and occurrence of disease.

This relationship has quickly gained room within the scientific community and has sensitized different groups and social actors whose interest is oriented to the establishment of healthy habits and behaviours in the search for better quality of living. The importance of the subject is shown in the great dissemination by the media, and its repercussions are shown in the drawing of legislation to regulate, for instance, the consumption of legal drugs or to control the compliance with safety traffic rules.

These concerns coincide with changes observed in the epidemiologic profiles, where infectious diseases leave room for chronic ones, as morbimortality by external causes increases, particularly those due to traffic accidents and homicide.

Epidemiology was consolidated as a discipline at a time when clinical work was also establishing its first scientific basis, and, with the advance of bacteriology as a support, it created its explanatory paradigm based

upon monocausal models. But in time, new variables were added to these models, among them those of social and environmental nature, which lead to a reformulation of explanations based on multicausal models. These were the basis for the operationalization of intervention programs based on different levels of prevention. The changes that took place in the causal relationship create an approximation between those concepts of lifestyle and risk or risk factor, central elements of modern epidemiology.

The medical-epidemiologic studies oriented toward the object lifestyle show, such as in epidemiologic studies in general, a variety of approaches, methodologies and also of conclusions, which may even be contradictory. But also, several associations have been shown with the right use of this method. Particularly outstanding among them are the studies of the relationship between tobacco use and lung cancer, diet and cardiovascular disease, alcohol and liver disease, posture and low back pain, sexual behaviour and sexually transmitted disease, work and labour disease, among others.

The latinamerican production in this field is almost negligible. And that is specially serious given the fact that the continent's population is in the intermediate stages of the epidemiologic transition, with two priority patterns: those of infectious and chronic diseases.

## **State of the art**

Published papers are oriented either to individual behaviour or to population groups. The analysis of production according to types of disease shows the importance of the relationship between these and lifestyles.

Regarding coronary disease, modifiable risk factors are identified (tobacco smoking, hypertension, high cholesterol levels...) as well as non-modifiable ones (age, sex and hereditary factors). The same factors are pointed out for cerebro-vascular disease and hypertension.

Concerning cancer, aside from tobacco and some viruses, researchers direct their attention to other risk factors, some of them rather obscure yet. Among them are some related to nutrition and exposure to chemical and physical substances and radiation.

External causes gain more importance everyday, and in some countries, such as Brasil, they have become the second cause of death. Together with traffic accidents, homicides appear with a great statistical weight in Colombia and in large urban centers of Brasil and Mexico. The socio-economic problems typical of large cities establish a close relation between urbanization and violence.

In the case of AIDS, its transmission is clearly related to lifestyles of large segments of the population. The importance of sexual behaviour patterns is well known, not forgetting the use of intravenous drugs.

Many other diseases could be analyzed, but the relative uniformity of

papers allows us to say that the most common interpretation of lifestyles is based on personal habits and behaviours that can be summarized as physical activity, nutrition, emotional stress and tobacco smoking. Simultaneously, some authors call our attention to structural factors, such as the inequitable distribution of income, the persistence of poverty and the changes in the life of large masses of migrants.

The information generated by this body of studies has allowed the implementation of intervention models whose greatest efficacy is found in those of a clinical nature. In collective terms, some promising situations are observed, such as the establishment of norms and regulations to protect the health of citizens, based upon epidemiologic evidence.

### **Research challenges**

The previous comments show the need to maintain an active line of research that includes studies on lifestyles and their manifestations, paying attention to two large areas.

The first one relates to the conceptualization of lifestyle as a component of the so-called risk factors. That means to understand risk factors from personal experiences, orienting a set of interventions to the solution of problems at the individual level and to that of those belonging to high risk groups. This situation fully agrees with the objectives and aims of clinical medicine. Thus, to recognize a citizen as the bearer of a disease, or to recognize him as exposed or living under certain conditions has good chances of reverting or preventing the disease.

Within this first approach, a second research scenario appears, which complements the former, comprising the analysis of environmental factors that may potentiate or diminish the impact of new technologies to improve the quality of living. We include here the environmental cleaning-up and others geared to the reversion of some effects of the modernization process or of non-sustained development, such as environmental pollution, family disintegration, illicit drug consumption and the generation of urban violence. The study of the opinion-generating mechanisms and behaviour models should also be included, television being foremost among them.

The second approach derives from search for a structural explanation that means to complement the knowledge generated in the former approach. It includes the analysis of those factors of the social structure. It implies their recognition both as attributes of the individuals and as determined by the dynamics of collective construction. Here are such factors as migration, education, nutrition, employment, housing, and its most evident component: poverty. They all mean a great challenge to research, as they demand a transdisciplinary approach and a complex methodological effort.

Research on lifestyles and modernity must include different levels of

understanding, according to the specificities of the many problems and health situations. A first level must go on with the description of explanations in the analysis of the so-called diseases of modernity. But the analysis of infectious and parasitic diseases must also privilege the links with lifestyle. After all, endemic diseases, aside from the ethiologic agent, find their explanation in the way how people live. The ways how people live or work are the environment where those pathologies find favourable conditions for their appearance. Furthermore, the AIDS emergency, which reinforces the need to work in the field of infectious diseases, emphatically shows their relation to human behaviour.

In the methodologic field, we should recognize the advance due to the ideas of risk factors in the explanation of diseases and the possibility of bringing them under control, particularly in the case of clinical interventions. From the epidemiologic perspective, we see an advance based on the quantitative techniques and methods, greatly facilitated by informatics. But the great discussions generated by actions derived from these analysis show the present limits of epidemiology as well as the need to go on improving its methodology, aside from claiming a better articulation with social and economic sciences, trying to better understand the origin and determination of lifestyles and their consequences.

When we try to establish a synthesis of the produced knowledge, the need to develop transdisciplinary studies becomes obvious. And that aiming at the establishment of safe orientations that may be applied by health services, based upon healthy habits and lifestyles.

## POVERTY AND HEALTH

Poverty is a growing problem, although there are now knowledge and means to revert it or at least to avoid its most devastating effects.

There are different definitions of poverty and that is of more than academic interest, because these definitions imply different quantifications. In turn, these lead to diverse assessments of the human development process of countries, and of the policies and resources that are needed for the social sectors.

Authors generally agree in recognizing two dimensions of poverty: an insufficient income and the lack of satisfaction of basic needs that the former brings forth. Some add a third dimension: marginality or social exclusion of the poor individuals or families.

The measurement of poverty shows important difficulties. One of them, derived from the difficulty to conceptualize the phenomenon, is the choice of indicators, which may be related to the income of homes (poverty lines) or to the satisfaction of needs.

Another difficulty is how to measure the duration of poverty. The method of unsatisfied basic needs is not adequate because there is a gap

between the fall of income levels and the dissatisfaction of some needs, such as housing and education. And poverty lines have the limitation of their inability to distinguish between recent and chronic poverty.

A third difficulty arises from the need to compare results, both among different populations and among different times for the same population. Most of the research carried out in Latin America has chosen to consider poverty with a relative criterion. Though this makes comparison difficult, it is said that the concepts of poverty and basic needs are related to specific scales of values and social contexts, that may be quite different.

In order to overcome these difficulties, a methodology has been suggested that crosses the criteria of income and satisfaction of basic needs, and defines four categories of homes: those in conditions of social integration, those in chronic poverty, in recent poverty and with inertial lack of some goods or services.

Studies carried out about poverty in Latin America and the Caribbean yield insufficient and sometimes contradictory information.

Different agencies provide figures and projections that are quite different on the number of the poor in the region. For instance, while CEPAL estimated a number of 183 million poor in 1989, corresponding to 44% of the total population, the World Bank had calculated a figure of 70 million. This is due basically to differences in the hypothesis, standards and indicators used.

Data on the distribution of poverty by age and sex shows problems and contradictions, although several authors point out that women and children are particularly affected. The information on poverty and ethnic group is even more scarce.

There are indicators of a growing urbanization of poverty (an increase in the percentage of urban poor out of the total poor population), but its dynamics is not well known.

The cause of poverty is a permanent source of discussion among economists, political scientists, sociologists and politicians. Explanations vary according to the philosophic and political views of each author. The papers of international agencies usually limit their approach to a description of the problem. Other authors pay attention to the reasons for the deterioration in recent years and its relation to the adjustment processes that the Latin American economies have suffered, without going into structural explanations either.

## **Health conditions of the poor**

There is a clear relation between poverty and the deterioration of health, where nutrition plays a fundamental role, but it is also important to recognize that health problems deepen and perpetuate poverty.

The mechanisms of the poverty-disease cycle are expressed from the

moment of gestation, when the malnourishment of the poor mother, the characteristics of her reproductive pattern and the inadequate care she receives are associated to a high infant mortality rate and to the risk of perinatal infections. During childhood, malnutrition leaves permanent sequelae, and the risk of contracting communicable diseases is increased by the poor conditions of the environment. In a mature stage, insufficient and/or inadequate diet, together with the frequency of disease, are the cause of a poor labour performance, particularly for those working in positions that demand great physical activity.

On the other hand, the loss of health may lead an individual and his/her family to conditions of extreme poverty. This happens for instance, when the head of the household stops generating an income as the consequence of disease, or when families have to make excessive expenses to confront expensive and /or prolonged treatments.

The fact that there is a deficit of health services for the poor population has been repeatedly pointed out. If we add the 140 million people who do not have today a regular access to health care plus the 90 million that will be added to the population during this decade, by the year 2000 it would be necessary to provide services to 230 million people more than those presently covered. These estimates assume that almost no poor in the region has access to health care, which is not equally true for all countries.

The Ministries of Health and the Social Security usually provide health services to the poor, in premises that are not generally used by other better - off members of society. With the policies to cut down the size of the State that have been applied in many countries of the region, there has been a reduction in the resources assigned to direct care in non-profitable social services, which have not been taken up by the private sector either. An assessment of the real impact of this process on the services of the region is still due.

## **Research challenges**

Subjects related to poverty are quite varied, so that research areas are also many. As we shall see in the following list, it is a multidisciplinary matter, since techniques from economics, anthropology, sociology, epidemiology, psychology and political sciences are needed to respond the numerous questions on the subject.

The causes of poverty have not been sufficiently studied, and what's missing are development models that are truly alternative and viable, and do not mean a temporary or permanent impoverishment of population groups.

There is ample room to deepen the knowledge on ways to measure poverty, looking for indicators that are suitable to different societies, but that also allow for some sort of comparison among groups and along time.

There is a need to deepen the knowledge on the culture of poor populations, since most existing works seem to consider "the poor" as a homogeneous category, no matter what society they belong to, which does not seem realistic, neither because of their history nor for the possible survival strategies available to them.

The issue of the social and political representation of the poor populations requires a much greater understanding. The presence of these groups in many of our societies is lived as a threat or a concern because of their number, but does not find a voice in the formal representation systems, or this is taken up by third parties, such as the churches, for instance. It would be important to get to know experiences of popular organization that have ended up in a true improvement of the situation of its participants, and had some degree of temporal continuity.

We need to know what is the health situation of the poor in each country, and the available statistics do not suit this need because of the lack of consideration given to the social class variable, which differs from the common practice of countries such as the United Kingdom, where this information is available. More than case studies, what is needed is the inclusion of this variable in the statistics of the countries of the region.

The lack of morbidity studies also hinders the knowledge of the health situation, specially of the population we are concerned with, that often bears through a lifetime the burden of different chronic diseases, communicable or not.

Applied research is needed on systems to supply safe drinking water and sewage that are of low cost and effective under different climatic and environmental conditions.

Information is also required on the existing levels of contamination in cities, and particularly in their marginal areas, both in air contamination with nitrogen and sulphur, and water contamination with sewage and industrial effluents.

There is yet much room for research on health care financing, particularly for the poorer sectors of society. There are no comparative studies on the effects of the different forms of payment on the access to services, nor on the health of the user populations, and information is likewise missing on what has been the effect on health services and population health of the different models of State reform applied in the region.

In a more restricted issue, there is also a need to know what intrasectoral resource reallocation mechanisms have been used successfully in the region (if any) in order to redistribute resources equitably, since all of them have their opponents.

The service delivery model is an area of study in itself. In the past decade, primary health care was the prevailing discourse, but since the World Health Organization has apparently given up its aim of Health for

All by the year 2000, it is not clear whether the strategy originally adopted is also in doubt. Without getting into that discussion, it is valid to wonder what is the most appropriate basket of care, both epidemiologic and economically speaking, for each region, and what are the mechanisms for those cases needing care other than that included in the basket.

The delivery of care in multi-ethnic societies, to migrant population or in particularly violent areas, poses specific challenges, that are yet far from being solved.

## PUBLIC HEALTH AND HEALTH SYSTEMS RESEARCH IN LATIN AMERICA IN THE LIGHT OF REFORM

Research on public health and health systems, is conditioned by a set of changes operating in and around health systems.

### A. Environmental changes

The great megatrends operating in the environment generate changes, and these, in turn, bring forth new research needs, not just concerning health-disease problems, but also the organization of health services, and the strategies to bring them closer to the population that needs them.

The main changes in the environment are:

-The demographic transition. In our countries this is characterized by the aging of population and the decrease of children in the total population, which implies changes in the disease profile and the demand for health services.

-The epidemiological transition. It is partly conditioned by the former, and has been characterized for Latin America as "delayed and polarized".

-Technological changes in health sciences, which generate new services and new research needs.

-Environmental changes, contamination, desertification, etc., are causing new demands and problems, requiring a response from the health systems.

We are witnessing a change of paradigms in health research. The new health-disease paradigm stresses multicausality of the health-disease phenomenon and recognizes the importance of setting objectives that are focalized towards certain sectors, thus enlarging the scope of public policies. Regarding policy design and programs development, it insists on health promotion, the prevention of disease and multisectoral policies.

### B. Changes within Health Systems

Never in contemporary history have Health Systems witnessed a time of generalized and multiple changes such as the present one.

In our region, until the post-war period, there was a predominance of health systems in which State participation was secondary, the

responsibility was shared by religious communities, mutual-aid societies, etc. In this period, health research was practically non-existent. In the fifties the State started to assume a more protagonic role, research was carried out at that time by state initiatives and by public agencies. In the eighties, and after the experience in some Latin American countries, a time of reforms was started, that could become a "third wave" in the orientation of health systems.

In the nineties, reform processes have grown, with the objectives of increasing the equity of benefits, management efficiency and effectiveness in the delivery of health services. On the other hand, reforms include objectives related to the quality of services, financial sustainability and user satisfaction.

In the coming years we may assume that a change in the economic model may give rise to reforms in most health systems of our continent.

### **The contributions of research**

Many of the reforms taking place in the countries of the region are based on assumptions without enough empirical validation, so that they could be considered non-scientific experiments. Under these conditions, it is acceptable to question the validity of their interpretations of the needs and problems of populations, and therefore, the efficacy and efficiency of the delivery of care.

On the other hand, in complex and changing realities, the contribution made by research becomes all the more necessary, since the decisions to be made are harder.

In the present stage of deep reforms, when not only the ways to deliver care are changing, but also their financing and control, we run serious risks of bankruptcy or inefficiencies, which force us to have solid information systems and the support of research for decision-making. On the other hand, it is necessary, with the aid of research, to find new ways to provide care that are more effective, efficient and better accepted by the population.

The WHO ad-hoc committee has identified some areas for research on health systems and health policy. They include Health conditions, Universality, Equity, Effectiveness, Efficiency, Quality, Intersectoral articulation, and Comparative analysis.

Research on these subjects will take place both at the level of policies and of programs and specific instruments.

## **ENVIRONMENT AND HEALTH**

Nobody denies that development must be based on a protected environment. This is conveyed by the concept of environmental equity, which means, to all according to their needs: biologically and chemically

clean water, soil with nutrients and free from heavy metals and pesticides, workplaces without acoustic, biological and chemical contamination and free from stress, and a macroenvironment that allows the normal development of species and culture.

Nevertheless, the environment suffers multiple threats that combine human and natural causes, such as global warming, the thinning of the ozone layer, contamination and salinization of waters, desertification, deforestation, erosion and the extinction of vegetable and human species.

Although in the developed world there is growing concern on this subject, translated into norms and practices that are more respectful of environmental quality, developing countries do not seem to have become fully aware of it.

### **Environmental problems in Latin America**

1. Urbanization is of potential benefit by facilitating the access of the population to different resources and services, but its characteristics in the continent have turned it into a source of contamination, marginality, violence and infectious diseases.

The perception of better opportunities has been a key factor of the rural-urban migration, which has determined the explosive growth of latinamerican cities in the second half of this century. The process has been too fast, disorderly and with extremely low investment in environmental protection.

2. Contamination of water, its loss or inadequate distribution, translate into a reduction in the volume of drinking water. Simultaneously, soil erosion and desertification are the causes of a gradual increase in temperature which is reflected in a decrease in rainfall.

The lack of drinking water is the main environmental threat to health in the continent. The contamination with infectious agents causes numerous diseases, from cholera and typhoid fever to common diarrhoea, and a large number of avoidable deaths. Likewise, some cases of contamination with heavy metals have caused an increase in the relative risk of some tumors and cardiac problems. Furthermore, the mineralization or salinization of water, which renders it unfit for agricultural use, affects the population directly through a reduction in the supply of food. Last, there is also a contamination of industrial origin that alters ecosystems. The solution of these problems has a cost that is often beyond the reach of latin american countries.

3. Atmospheric contamination is caused by natural factors (geologic characteristics and thermal inversion phenomena), as well as human factors (use of tobacco or some fuels, overutilization of cars, uncontrolled industrial activity, lack of pavements, etc.

4. Soil contamination is a consequence of the poor processing of

industrial waste, mining activity and deforestation. Besides, through the continent, the management of solid waste is very bad, while its volume increases with the industrialization process. This waste is stored in inadequate areas, causing the contamination of subterranean waters, the development of vectors and other environmental problems.

5. Pesticides, fungicides and herbicides may cause the disease and death of rural workers with a great exposure to them. Besides, pesticides that have been banned in many parts of the world, (such as DDT, that has the property of accumulating in the food chain) are marketed and used without any control in Latin America. There are no studies on this subject in the region, nor registries of morbidity, disability and mortality related to the use of these substances.

6. The thinning of the ozone layer is estimated to be from 20 to 35% from 1979 and its reduction progresses at 2% per decade. This layer is an important filter of ultraviolet radiation, whose increase may bring forth skin cancer and cataracts, as well as to decrease oxygen production via the alteration of fotosynthesis by sea plancton. The Antarctic and the Southern Cone of Latin America are the most severely affected areas. Fluorocarbonated gases are the main responsible agents of this problem, but only Canada, the United States and Europe have regulated their manufacturing.

7. Global warming is about 0.1 °C per decade. It may obey partly to natural causes, but one of its main factors is the greenhouse effect, through which the existing concentration of CO<sub>2</sub> and methane in the atmosphere "trap" the heat from the earth. This causes the appearance of vectors where they did not exist before, as well as the possibility of the multiplication of Vibrión Cholera in the sea plancton. Among the new risks posed by this problem are the apparition of malaria, dengue, yellow fever and Chagas disease where they did not exist.

8. The labour environment may be exposed to different contaminants: pesticides, solvents, heavy metals and deletereous dusts, atmospheric and acoustic pollution, among others. The latinamerican labour market is cheap and barely regulated; that is why the work sites often show an important degree of different sorts of contamination.

9. Home contamination, caused by tobacco, fuels, chemical products, some building materials and microorganisms, may be the cause of different illness, from allergies to serious disease. Because they stay longer at home, children and elderly people are more exposed to these contaminants.

### **Research challenges**

The few studies carried out in Latin America about the effects of contaminants on human health are of an academic nature and privilege clinical and hospital research. The shortness of resources does not

permit to carry out prospective studies, but just small case/control studies. Since the continent is in the worst possible scenario for almost all factors, it is necessary to carry out epidemiologic research with a populational projection.

One of the great challenges is to promote solutions that are ecologically acceptable and economically affordable to solve the problem of water contamination. The actions of a technical nature (sewage treatment, gaining clean waters, control of biologic and chemical pollution, development of non-contaminating industrial and agricultural processes) must be complemented with actions of an educational character, that stimulate the population to protect water. The setting of new industrial processes should include studies on the use of water and the risks of contamination.

In Santiago de Chile, the effects of atmospheric pollution on human health have been studied, and the results show a higher frequency of respiratory symptoms, and of the relative risk of several pathologies. These studies have been the basis for making projections for other latinamerican cities with similar pollution factors and levels of contamination. Likewise, a protocol of care of these diseases at the ambulatory level has been developed, which has contributed to decrease mortality and to prevent hospitalization.

Till the causes of atmospheric contamination may be overcome, strategies must be developed to fight the diseases associated to this phenomenon. In order to do so, outpatient protocols of care should be studied, following the line of the chilean example. Epidemiologic studies should also be carried out in other cities with an important air pollution, studies of the accumulation of respiratory damage in exposed individuals and of the exposure to carbon monoxide of people with coronary disease.

It is necessary to study the metabolic alterations in workers exposed to agrochemicals, as well as to implement epidemiologic surveillance systems. In parallel to that, studies should be carried out aiming at obtaining a better knowledge of the effect of these agents. Finally, it is urgent to design and incentivate the use of agricultural procedures that reduce the need for pesticides.

The trend and risk of the thinning of the ozone layer should be studied in order to diminish the damage to those populations that are already exposed to it, particularly in Chile and Argentina. The effect of ultraviolet radiation on the immune system should also be studied. It is necessary to educate the population about these risks, as well as to promote the regulation of products containing fluorocarbonated gases.

It is also necessary to study and monitor the changes in the distribution of vectors, because of planet warming.

Labour health is an area that should be deepened. Competitiveness should not be attained through cost reductions that mean an insult to the health of workers and the environment.

In the domestic environment, the priority is the search for low cost fuels that do not mean a threat to human health and the woods.

About the urbanization phenomenon, activity should be oriented to create stimuli for the population to remain in small cities or in the rural areas. That requires a better diagnosis of the reasons for the rural-urban migration, and the development of methodologies to educate children and adults in the rural areas, to educate and inform about the risk of living in large cities and the benefits of staying in the rural environment or in small towns, aside from creating the economic conditions to make that possible.

Every new industrial process should have studies on the possible environmental damage it could cause. It would be most positive if these studies were translated into laws that stimulate recycling and reforestation, prevent deforestation and foster a sustainable agriculture as well as an industrial development that is respectful of the environment.

## **References**

1. The information on science and technology financing in Latin America is based on five countries: Argentina, Brazil, Chile, Mexico and Venezuela, that are responsible for almost 90% of the production and expenses in science and technology in the region.

# HEALTH RESEARCH IN LATIN AMERICA AND THE CARIBBEAN TENDENCIES AND CHALLENGES

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In this introductory chapter an approach is made to the description and analysis of the new tendencies and challenges that scientific health research is facing in Latin America and the Caribbean (LAC), exploring their relationship with the health situation, with the scientific-technological dynamics at world level and with the new socio-economic development models that are being implemented in the Region.

Only after the fifties did some of the Latin American countries express explicitly their concern to promote and strengthen the capacity for scientific research (García, 1982). State agencies were created with this objective in countries such as Argentina and Brazil, as a response to the initiatives of outstanding scientists. The initial orientation of these agencies, which were strongly influenced by the scientific community linked to universities, was to strengthen the research capacity through scholarships and project subventions, with scientific quality as their main concern.

As from the mid-sixties, and especially during the seventies, many countries created their own central agencies, stimulated by the recommendations of conferences sponsored by the UNESCO and the OAS. One of the differences, compared to the previous tendency is that these agencies are not called Research Institutes but Institutes of Science and Technology, and do not depend from the Ministries of Education but from the Ministries of Planning. These changes in name and location are not trivial ones. On the contrary, they reflect the acknowledgement of the need for a closer relationship between science and technology and planning the socioeconomic development. During this period the concept of S&T system comes up, with the aim of achieving the coordination of the different institutions that participate in the area.<sup>3</sup>

Towards the end of the seventies, certain signs of the limitations of this approach start to appear, beginning with the conflicts generated by the resistance of the scientific community to the increasing influence of

economists and planners in the process of drafting the scientific policies. The object of creating a S&T system organically articulated with the policies of socio-economic development was never achieved, in spite of repeatedly expressing this intention in the development plans and programs of the majority of the countries of the region. Except for a few specific successes, the policies in this area continued being basically oriented at strengthening the supply side, which means, (Mari, 1983), they were aimed at supporting projects and groups with public resources, without being able to establish articulation mechanisms at institutional level between research, development and the production of goods and services.

As to the financing of the sector, very few countries had been able to achieve the objective of dedicating 1% of their GDP to S&T activities, the average remaining at about 0.6%, while in developed countries this figure reached 2.7%. In spite of the unquestionable achievements of these policies in strengthening the research infrastructure, Latin America was responsible for scarcely 0.97% of the scientific articles included in the database of the Institute for Scientific Information (ISI) in 1973, and for 1.14% in 1984, a contribution which is lower than that of countries like Belgium and Israel (IDB, 1988).

The creation of state S&T agencies in charge of centrally defining S&T policies is based on the prevailing conception, at that time, of the State as the main development agent. As a matter of fact, in Latin America the State has always been the main planner, financier, executer and user of the results of the scientific and technical activity. In the mid-eighties, the State was responsible for approximately 80% of the resources used by the sector, whereas this figure is 40% in developed countries (CEPALC, 1990).

The economic crisis of the eighties that affected the majority of the countries of the Region became a serious threat to universities and public research institutes which strongly depended on state resources. The isolation from the rest of the society of the incipient scientific communities created in the preceding years, endangered their social legitimacy and made them a vulnerable target of the adjustment policies and the reduction of the public expenditure. The relative participation of Latin America and the Caribbean in the total world R&D costs was 0.8% in 1973, this increased to 1.7% in 1980 and decreased again to 0.7% in 1988. Absolute values for the total world R&D costs are 97, 218 and 435 billion US dollars, respectively (Salomon, 1994).

In the nineties, a series of changes at world and regional level, both at macroeconomic level and in the dynamics of the scientific and technical development, determine new tendencies in the organization and development of the scientific activity in LAC adding, in the case of S&T in health, the influence of changes in demographic profiles, morbidity and organization of health care.

The globalization of economic activity, the constitution of megamarkets, the increased market participation of technologically intensive goods and the establishment of competitiveness patterns based on the control of new technologies, are some of the tendencies at world level that are having great impact on the acceleration of technical change.

They are responsible for institutional changes such as new patterns of access to innovations, alliances between networks and enterprises and the strengthening of international protection mechanisms of intellectual property (Avalos, 1990).

In the area of the LAC, the economic crisis and the new economic and political outlook at world level accelerate the deterioration of the prevailing development models which never succeeded in overcoming the economic underdevelopment, nor in solving the serious social problems nor in promoting political stability.

Worth emphasizing among the characteristics of the new development models whose implementation begins towards the end of the eighties and beginning of the nineties are the economic opening, together with the decreasing importance of the national markets, and the reformulation of the role of the State.

The organization of the scientific and technological activity, in accordance with this new framework cannot continue being based on the centralized planning and almost exclusively leading role of the State. The latter should concentrate on developing its capacity to attract other actors, specially S&T institutes, and goods and services producing enterprises, promoting in them the capacity to assess and predict the scientific and technological advances in order to establish strategic alliances and to identify the access channels to knowledge and technology, as well as the mechanisms of transferring technology to other sectors of society. In other words, the State should have the role of establishing stimuli and defining the "rules of the game", for the several actors involved in the S&T activities.

Situated at the crossroads of S&T and health policies, the organization and development of the scientific and technological activity in health suffers the influence of these general determinants, to which the specific sectoral changes should be added. Some of these are new problems derived from the demographic and epidemiological transition, the impact on health of changes in the conditions and lifestyles of individuals and social groups, and the political and economic implications of changes in the organization and financing of health services. It should be pointed out that health services, apart of the basic role of contributing to the improvement of the health situation, are acquiring an increasingly economic and technological dimension, because they are a privileged sector for the development, incorporation and adaptation of new technologies that are of interest to other sectors, such as biotechnology, microelectronics, fine chemistry, new materials and others.

This situation requires not only the development of scientific and technological training, but also profound changes in the characteristics of the scientific health community and in the institutional agreements that enable the development, dissemination and use of the knowledge and technologies.

Some of these changes are already under way. The field of S&T in health is gradually no longer limited to the research process developed by physicians in health services or schools of medicine. "De-medicalization" of health research is accompanied by the widening of the universe of problems and the diversification of disciplines, focus, research types, professional training of researchers, the institutional area where research is carried out, the mechanisms of dissemination and incorporation of knowledge and technologies, etc. (Pellegrini, 1994).

In the following pages, some of these new tendencies and challenges will be analyzed, starting with the analysis of some general tendencies related to the financing of S&T activities.

### **New trends in the financing of S&T in Latin America<sup>2</sup>**

The preliminary results of a study will be presented, which was designed to describe the tendencies observed in the nineties, of the sources which foster S&T activities, in particular S&T in health, in five Latin American countries: Argentina, Brazil, Chile, Mexico and Venezuela. Two external financing sources are also included in the study, namely the World Bank and the IDB.

The secondary sources consulted for this preliminary study were limited to the national accounts and the reports of the WB and the IDB.

In general terms, the S&T expenses in the selected countries vary between 0.24% and 0.75% of the GDP. Two tendencies of nineties are worth noting: the increased participation of enterprises in the S&T expenses, and the increase in the external financing, particularly from IDB and the WB, mainly for activities of technological innovation.

These general "modernization" tendencies of the S&T sector are seen more evidently in Chile and Mexico, specially in the latter (before the events of 95). One can observe a significant increase of the total S&T expenses, increased participation of the private sector, prioritization of scientific and technological development in frontier areas, the stress on the technological innovation and the tightening of the bonds between research and the productive sector, with the creation of agencies and funds destined to the promotion of these activities. Venezuela and Argentina are the countries that are lagging behind in these aspects.

Between the years 90/93 health sciences absorb an average of 25% of the R&D public resources in Argentina, 4% of the S&T federal expenses

in Brazil and Mexico (with a rising tendency in the former and decreasing tendency in the latter), 34% of the CONICIT resources in Venezuela and 17% of the FONDECYT in Chile. More details of the selected cases are presented in the following section.

## **Argentina**

National Expenditure on S&T (NES&T) in Argentina in 1994 was about US\$ 680 million, which is 0.24% of the GDP. The greatest contribution came from the Public Expenditure on S&T (PES&T), which in 1992 contributed 85% of the total NES&T (US\$ 576 million). The remaining NES&T corresponds to the private sector with approximately 8%, external financing with 2% and other sources with 5%.<sup>3</sup>

This percent distribution indicates, for the nineties, a lesser relative weight of the public sector in the GES&T, which was 95% at the beginning of the eighties. At the same time a decreasing participation of the PES&T in the GDP is observed, which falls from an average 0.27% between 80/88 to 0.22% between 89/94.

Together with the receding public sector participation in the NES&T, an increase in external financing is observed. In 1993 the IDB granted a US\$ 95 million loan for the strengthening of the bonds between research centers and the productive enterprises through the creation of the Fondo Tecnológico Argentino (FONTAR - Argentine Technological Fund). In June 1995, the World Bank granted a US\$ 165 million loan to reform the higher education system.

Three institutions have historically centralized 80% of the PES&T. The Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET - National Scientific and Technical Research Council) with 41% of the PES&T, is the main executive organ of the national S&T policy.

S&T expenses during 1992, according to type of investigation, are distributed as follows: Applied Research 60%, Basic Research 35% and Experimental Development 6.1%. In 1980 these figures were 25.5%, 45.6% and 28.9%, respectively, showing a significant decrease in the research expenses of experimental development is observed.<sup>4</sup>

Exact and medical sciences are, historically, the areas of greater PES&T, with 32% and 26% respectively, similar percentages being maintained in 1992 and 1980.

To sum up, the S&T expenses in Argentina are among the lowest in the selected countries, some changes are taking shape such as the increase of external funding and incentives to increase the private sector participation. The relative participation of expenses for experimental research descended dramatically since 1980, indicating a decrease in the importance of research aimed at technological innovation and production. Medical sciences are still one of the most important areas of PES&T.

## **Brazil**

In 1990 NES&T in Brazil was US\$ 2940 million, which is 0.72% of the GNP. The private sector was responsible for 20% of this expenditure. Between 1980 and 1990 the proportion of the NES&T in relation to the GNP varied from a minimum of 0.43% to a maximum of 0.85%.

During the eighties, the Federal Government committed between 50% and 70% of the NES&T, whereas the state governments committed between 10% and 30%. Between 1990/1993 there is a downward tendency of the Federal Expenditure for Science and Technology (0.52% of the GNP in the years 80/89, and 0.39% in the years 90/93) and a corresponding increase in governments expenditures.

Between 1990/95 the World Bank and the IDB supported S&T programs for US\$ 412 million, surpassing by 63.5% the amount received during the previous decade. Between 80/89 the IDB and the World Bank granted loans for US\$ 252 million US\$ 72 corresponding to the World Bank (mainly for the areas of biotechnology, chemistry and geosciences) and US\$ 180 to the IDB, for higher education programs. Between 90/93 Brazil received US\$ 150 million from the World Bank to continue the research and training programs in the mentioned areas and US\$ 262 from the IDB. From these, US\$ 160 million in August 1995, 70% of which were dedicated to programs in support of development and modernization of national technological enterprises.

The Federal Expenditure for Science and Technology (FES&T) in 1993 was distributed as follows: postgraduate education and grants 45%, basic research 27%, applied research 24% and experimental development 4%. From the analysis of the distribution of FES&T in 90/93, compared to 80/89, the following variations are observed: basic research +77%, higher education +11.6%, applied research -77% and experimental development -21%.

The average yearly figure of FES&T spent on Health and Sewerage between 90/93 was US\$ 64 million, which makes up 4% of the total FES&T. In spite of being a small proportion, this figure corresponds to a 32% increase compared to the 1986/89 period, taking into account the fact that this relative increase takes place at a moment where there is a tendency to a FES&T decrease.

To summarize, in spite of the few data available, a tendency can be observed towards a decrease and decentralization of the public expenditure in S&T, an increase in the participation of external sources and a concentration of resources of the latter to strengthen the FINEP<sup>5</sup> and associations between S&T institutions and private economic agents, whereby a greater participation of the private sector in the NES&T is foreseen for the future.

## **Chile**

The NES&T in Chile shows an increasing tendency, rising from US\$ 82 million in 1986 to US\$ 100 million in 1987 and US\$ 282 million in 1992. This increase is in accordance with the GNP percentage assigned to S&T, which went from 0.53% in 1987 to 0.75% in 1992 (for 1993 this figure will probably reach 0.78% of the GNP) and with an increased participation of the NES&T in the national budget, which grew from an average 6.5% between 80/89 to 10.5% between 90/92.

The PES&T is the main funding source, whose participation in the NES&T varies between 89% and 99% in the eighties, but has a decreasing tendency with the increased participation of the private sector. Notwithstanding this decrease in the percentage (88% in 1992), the PES&T has grown in absolute values, with an annual average for the period 90/92 of 94% above the annual average for the period 80/89 (US\$ 194 million in 1992).

In 1992, Chile signed the first loan with the IDB for S&T programs for US\$ 94 million, directing these towards three funds: the FONECYT (10%) assigned to researchers without thematic priorities, the FONDEF (60%) oriented towards universities and technological institutes working in priority areas, among which biotechnology is included, and the FONDEC (30%), directed at technological development projects with private enterprises.

Within the PES&T, in the years 90/93, the FONDECYT has increased its resources in 165% with relation to the period 82/89, attaining a relative participation of 54% of all the S&T funds between 90/93. During the 82/93 period, the FONDECYT has financed 530 projects in the medical area for nearly US\$ 15 million, which makes up 17% of the resources financed by that fund.

Finally, it is worth pointing out that the resources spent by enterprises on S&T have been continuously increasing, rising from US\$ 5.5 million in 1982 to US\$ 33.9 in 1992. The percentage of participation in the NES&T also increases, rising from 2.5% in 1980 to 12% in 1992.

## **Mexico**

In 1991 the NES&T was US\$ 1,652 million, representing 0.47% of the GNP, from which 77% were provided by the Federal Government and 22% by the private sector.

The FES&T between 89 and 93 grew 66%, and the average of the 90/93 period is 16% higher than the average of the years 80/89. In terms of the participation of the FES&T in the GNP, this had decreased from 0.43% in 1980 to 0.27% in 1989, increasing then up to 0.41% in 1993 (0.44% is estimated for 1994).

A growing tendency of the expenditure of the private sector is also

observed, with an increase of 80% between 84 and 91, and an increase in the relative participation in the NES&T of 15% in 1984, to 22% in 1991.

This evolution reflects the changes that have occurred towards the strengthening of S&T development of the country, so as to adapt its economy to the demands of the NAFTA. The federal government has set the aim of increasing the NES&T, in terms of GNP percentage, to 2% by the year 2000 and achieving a public sector participation of 50% by that same date (World Bank, 1992).

In the years 92/93, external loans of the World Bank and the IDB were granted for S&T projects for US\$ 369 million, which represents an increase of 200% compared with funding received during the period 80/89.

The federal government has given priority to the area of "general advances in knowledge", with 54% of the FES&T between 90/93, an area which includes the National Modernization Program of S&T (PRONCYMT), which encourages a greater public sector participation in R&D, the National Modernization Program in Education and the Industrial and Foreign Trade Modernization Program (PRONAMICE). The Research and Development Fund for Technological Modernization (FIDETEC) and the Fund for the Strengthening of the Scientific and Technological Infrastructure have been created (FICTEC).

The health sector received 3.7% of the FES&T in 1993, making evident a relative decreasing tendency, as the participation of the sector, with respect to the FES&T, was 4.1% in 90/93, whereas the average for the years 87/89 fluctuated around 5.4%.

## **Venezuela**

The S&T sector in Venezuela is markedly of public origin (95%), in 1994 it increased to US\$ 192 million, which represents 0.34% of the GNP and 2% of the total public expenditure.

There was an increase of the PES&T in the early nineties, both in terms of percentage of the GNP and of the National Budget.

In spite of the drop observed in 1994 (US\$ 192 million, compared to 1993 and 1992, with approximately US\$ 300 million per year), the average PES&T during the years 91/94 is more than 31% of that achieved between 88/90.

Towards the end of 1990 Venezuela received the first IDB loan for the S&T area, consisting in US\$ 47 million to support projects, training in human resources, infrastructure support and technology transfer in the priority areas of biotechnology, fine chemistry, new materials, electronics and computer technology.

As from 1990, the Fund for the Development of Technological Innovation (FINTEC) is the main funding agency of S&T, with specific responsibility in the area of industrial reconversion.

At the beginning of the nineties, the National Council of S&T (CONICIT) also increased the funding of programs and projects. Between 91/93 the average amount of resources assigned by the CONICIT increased 247% compared to 88/90, with an annual average of US\$ 2.4 million.

In 93 the area of medical technology and science is the main receptor of the CONICIT funds (US\$ 800 thousand). The resources for this area increased 550% in 91/93 compared to 88/90, rising from a participation of 22% of the total resources of the CONICIT in 88/90 to 35% in 91/93.

## **Interamerican Development Bank**

In the sixties, the IDB began to assign funds for the development of higher education, science and technology. Since then the Bank has made about US\$ 2.000 million available for Latin America and the Caribbean, in the form of loans and technical cooperation in these areas, for projects that have an estimated cost of over US\$ 5.900 million. (Tables 2 and 3)

The volume of S&T program funding of the IDB in the period 90/95 was US\$ 791 million. From 61 to August 95, Argentina, Brazil, Chile, Mexico and Venezuela have received 80% of the funds of the S&T Program, and 45.7% of the Program of Higher Education.

During the 61/87 period, the Bank's financing was dedicated to the creation of R&D training in universities and public research centers, mainly through scholarships for postgraduate studies abroad and for the construction and equipment of laboratories, libraries, computer centers, etc.. Funding was channeled through the central state S&T agencies, such as COLCIENCIAS in Columbia, CONACYT in Mexico, CONICET in Argentina and CNPq and FINEP in Brazil.

Since 1988, with the changes in the development models and the search of the different countries, for greater competitiveness for their production, the IDB also changes its policies, passing on to prioritize, the creation of links between producers and users of knowledge and techniques. This is expressed in an alteration of the structure of the S&T programs financed by the IDB, which for the 91/95 period shows the following characteristics:

- an increase in the financing volume for S&T programs. Between 91/95 the IDB approved 60% of the total resources to be channeled to S&T in the last 33-years.
- a decrease in the financing of infrastructure programs;
- an increase in the resources for applied research and experimental development. The proportion of this funding increased in 70% in the case of Brazil, 49% in Argentina, and 31% in Columbia;
- an increase in technical education and vocational programs, financing 44% of the total number of programs between 89/95, since 1962.

- an stimulus to the creation of technologic development funds to support companies in their technologic innovation efforts.

Since December 1993, the IDB has stopped contracting new operations in S&T, probably because of the predominance of a conception that investments in R&D should be oriented by the market. At the time being that policy is in full revision.

Another IDB source of resources for health research, specially for the research of health systems and services, is represented by the loans in the health sector. Between April 93 and April 95, ten projects were approved for Latin America and the Caribbean for a total amount of US\$ 311.45 million, and 17 others have been proposed for a total amount of US\$ 857.8 million (PAHO, 1995). Nearly all the projects are for financing the reorganization of the health systems and include a study component to support this process. A final analysis at the end of the execution of these loans will help verify whether this potential source of resources was actually used for the development of studies and projects carried out by research groups of the region.

## **World Bank**

The World Bank has been providing funds for the area of S&T through specific loans since 1970, for a total amount of US\$ 3,180 million, whereby, 23.6% of the total funds granted by the bank in this area were concentrated in 90/91.

With reference to the selected countries, up to 1990 the World Bank had granted only one loan to Brazil for US\$ 72 million. As from that date, the World Bank provides funding for three projects:

- Brazil, 1990, US\$ 150 million (6 years), for research and training in biotechnology, chemistry and chemical engineering, mineral technology and geosciences;

- Mexico, 1992, US\$ 189 million (6 years), the majority for the restructuring and strengthening of the CONACYT;

- Argentina, 1995, US\$ 165 million for the Higher Education Reform. The National Committee for University Evaluation and Accreditation (CONEU) and the Fund for Quality Improvement (FOMEQ), were created, aimed at improving the quality and efficiency of the pre and postgraduate programs and the funding of laboratories, equipment and libraries, specially in basic sciences and engineering.

As in the IDB case, the World Bank has been funding a great number of projects in LAC to reform the health sector, which represent an additional funding source for research in health, because many of them include a component of study and operational research. Between March 1988 and April 95 the World Bank approved 25 projects in the Region in the health area, for a total amount of US\$ 1,492.6 million (Table 5). The same as in the case of the IDB, only after the subsequent analysis will

it be possible to determine whether this potential source of funds for health research was, in fact, used.

## **Tendencies of the scientific production in health in Latin America**

What follows is the analysis of some of the tendencies of scientific production in the area of Health Sciences in seven Latin American countries (Argentina, Brazil, Chile, Cuba, Mexico and Venezuela) during the period 1973-1992, based on the number of publications by authors living in these countries during the mentioned period. The six selected countries are responsible for about 90% of the total scientific production of Latin America and the Caribbean, both in Science in general, and in the area of Health Sciences (Garfield, E., 1995).

This type of study, called "sciencemetrics", was developed at the beginning of the sixties by sociologists and science historians who became interested in the possibility of carrying out quantitative analyses of their object of study. Later on, towards the mid-seventies and coinciding with the concern for the increasing costs of scientific activity and the evaluation of its results, planners also became interested in this type of study, recognizing its potential for supporting the S&T planning processes, until then based almost exclusively on the opinion of experts (Velho, L., 1994).

Notwithstanding the criticism to which these studies are subject, both in their conceptual and methodological basis, they enable the understanding of some general tendencies of the scientific production in health in the Region. Taken with caution, they may contribute to defining policies in this area.

The period considered is relatively extense for studies of this type, and allows to analyze some aspects of the tendencies of the scientific activity in health in the six countries. During this period important economic, social, political and institutional transformations took place; this was a period of crisis, adjustments and resumption of economic growth, as well as deterioration and recovery of democratic regimes. All these macro-processes, as we will see, might be related to some of the findings that are presented.

The database used was that of the "*Institute for Scientific Information (ISI)*", in Philadelphia, U.S.A. This database is quite selective and includes nearly 3,500 journals, the most important in several areas of the sciences. According to its creator, E. Garfield, this selective coverage is done not only for economic reasons, but in recognition of the fact that, in any given area, the number of relatively important journals that are most frequently read and quoted is relatively small (Garfield, E., 1995). This database, therefore, does not allow an inventory of all the scientific production of the countries taken into consideration, but only of the part

of this production that is in circulation in the international literature of highest quality.

The ISI database uses 89 *Category Codes* to classify the total number of scientific areas. From these we have selected 38 to mark the field of Health Sciences (including only human health). We then subdivided this into three areas: biomedical, clinical and public health research (Frenk, J., 1986). What follows is the result of a preliminary analysis of these data, which enable the identification of some very general tendencies. The records enable more specific analysis at a later stage, with the aim of identifying thematic tendencies, disciplinary focus, cooperation networks between researchers and institutions, etc.

## **Main findings**

1. Between 1973 and 1992 the total number of publications by authors residing in the six countries was 41,238, 38.3% of which were produced in the first decade and 61.7% in the second (Table 1). As can be observed, the greatest increase occurred between the first and second five-year period, which coincides with a growth of the economic indicators and the S&T expenses for all the Region. Later, during the eighties and, particularly as from 1983, a decrease of the S&T expenses is observed in most countries, with a recovery at the end of the decade (Sagasti, FR. and Cook, C., 1985), a fact that may be related to the variations observed in the growth rate of the number of articles.

The information by country, shows that, the growth of the number of articles is not even during the period. In Mexico, Argentina and Venezuela, the scarce growth between the third and fourth five-year periods is striking, particularly in the case of Venezuela, which had an important growth between the first and second five-year period, falling considerably in the following years, and having negative growth figures between the third and fourth. This behavior might be related to the strict economic adjustment policies and the decrease of the public expenditure applied in these countries towards the end of the eighties (graph 1)

2. It has already been mentioned that the six selected countries account for about 90% of the articles registered at the ISI. This high concentration is also verified within this group of countries, since 61% of their total production between 1973 and 1992 comes from Argentina (28.1%) and Brazil (32.9%). This concentration shows an increasing tendency during that period. Taking the two extreme years into consideration, we observe that Argentina and Brazil, that accounted for 57% of the articles in 1973, pass on to contributing 68% in 1992. It is interesting to observe the change of the relative weight of the paper from Argentina and Brazil. The shift in position is already observed from the first to the second five-year period, when Brazil increases from 22% to 31% of the total number of papers, whereas Argentina decreases from

33% to 28%. This shift is due both to the significant increase observed in Brazil in these two periods (110%), and to the low performance of Argentina (25% increase), which is less than the average growth of the six countries (48%), a fact that might be related to the political-institutional instability of this country in the mid-seventies.

The degree of concentration of scientific production of the six countries in the three areas, biomedical, clinical and public-health, is not homogeneous. Clinical research, which is the one with the longest tradition in the region, is distributed more evenly, whereas biomedical and health research have a high concentration in Brazil and Argentina, that account for nearly 70% of the papers published in each of these two areas. Brazilian authors are responsible for 60.7% of the 1,107 papers on Public Health, a concentration with a rising tendency in the period (graph 2).

The previous fact is quite significant, and is cause for concern, as research in Public Health, which includes epidemiological and health services research, is crucial for decision making on health policies. Due to the diversity of situations and problems in health at populational level, the research capacity in Public Health should be widely disseminated, a fact that is not observed, at least in the production of excellency recorded in the ISI database.

3. The distribution of papers by areas shows a strong predominance of focusing on the individual rather than on the population when analyzing health problems: only 2.7% of the articles were classified as public health research, whereas clinical research accounts for 53.4% and biomedical research for 43.9%. On analyzing the average of references received per article, the situation of public health research is even worse. While the average number of quotes to the articles of the six countries is three (3) per paper (less than half the average of references received for the total number of papers of the ISI database, which is 7.78%), the articles on biomedical research receive an average of 4.03% and the ones on public health 1.61%.

Nevertheless, the tendency throughout the period is that of a relative growth of research in public health and biomedicine, with the resulting decrease in the relative importance of clinical research (graph 3).

This tendency apparently goes along with the tendencies observed in the world literature, with a certain time lag. In 1983, PAHO carried out a study on the tendencies of scientific production, comparing publications of the world literature with the Latin American (García, JC., 1982). For the former the NLM Index Medicus was used, and for the latter, the BIREME Latin American Index Medicus (IMLA). In the world literature between 1966 and 1980, the thematic areas with the largest expansion were physical sciences related to health (+193%), biological sciences (+143%), and public health (+148%), whereas the growth for all the areas together was 51%. Comparing the production profile catalogued in the

IM for 1980 and in the IMLA for 1979-1982, it is observed that from the 14 categories of the MeSH (Medical Subject Headings), the great majority of articles of the IMLA are included in the category of diseases (42%), while in the IM only 15% of the articles were classified in this category, indicating a greater concern in LAC for the study of diseases, in relation to the study of the basic biological phenomena.

Finally, the Garcia study concludes that the profile of Latin American publications for the period 1979-1982 is more similar to that observed in the international literature in the mid-sixties than in the year 1980. The tendency observed in the present study, i.e. an increase in biomedical research and decrease of clinical research, reflects a tendency to approximate the scientific production of the authors of the six countries to the distribution profile observed in international literature.

4. A phenomenon that in some way also expresses a "modernization" of the scientific activity in the countries that were studied, is the growing degree of "collectivization" of this activity, which may be expressed by the tendency in the relative fall of the number of articles published by isolated researchers. In fact, in the first decade of the period, the number of articles with only one author is 17%, a percentage that decreases to 10% in the second decade, while the articles with more than six authors rise from 8% to 15% (graph 4). This "collectivization" phenomenon of scientific activity is also expressed at institutional level both in the country and abroad, and can be verified by the increase in the number of articles whose first author belongs to one of the selected countries and the remaining authors belong to other national or international institutions.

5. A more detailed study was carried out on the scientific production of the six countries that was published in the eleven major international journals on epidemiology, where 95 articles were found. A high concentration of this production is observed for one of the countries, Brazil, with 66% of these articles. Most articles (96%) are related to infectious and mother/child diseases, with quite a small presence of studies on chronic diseases (4%).

In the international literature, this profile is quite different, as nearly 78% of the articles refer to chronic diseases. The articles on epidemiology published by authors from the six countries received an average of 4.36 quotations per article, which is quite a high index, when compared to public health (1.61) and to the total number of articles (3.1).

## HEALTH RESEARCH AND DECISION MAKING PROCESS

The financing, organization and provision modalities of health systems and services in the Americas are undergoing important transformations, among which are the change in the role of the State, new insurance schemes and financing of services, greater presence of the private sector, decentralization of administration and decision-making processes, greater social participation, etc.

In view of these changes, there is an increased need of a better knowledge of these processes through research. Their results should contribute to a more adequate and effective way of facing the new challenges and more rational decision-making to invest scarce resources (Palomo, AM., 1991).

The use of research to guide decisions on policies is more complex than might appear at first sight. In this item, a summary is made of the complexities of this subject and some strategies are outlined to increase the use of research results with the aim of improving relevance, adequacy and efectivity of health policies.

### **Attempts of responding to the challenge**

During the last decade, several organizational attempts have been made to incorporate more research and researchers into the policy making process. Programs, organizations and agencies, have been proclaiming the usefulness of research for the decision-making process, trying to sensitize national governments to increase their investment in health research. Training activities, workshops and conferences are being organized to strengthen the links between researchers and decision-makers.

International agencies are trying to provide more resolute support to research oriented to policy definition. Such is the case of PAHO/WHO, the IDRC in Canada, the Applied Diarhoel Diseases Research (ADDR) of the USAID and others. Interesting results have been achieved in research estimating the dimension and importance of several health problems and assessing interventions which, in theory, are of great value for the decision-making process.

The challenge for these donors and for the researchers who receive their support is how they might increase the vision and relevance of their results to attract the attention of the decision-makers.

It is important to mention the effort of local and national research groups to produce applied research, and the interest of local and national decision-makers in the results of research that supports their decisions. These two groups, researchers and local and national decision-makers are the object of some programs that try to increase the use of research in policy definition, but are the ones that are less known.

## **The need for clear definitions and realistic expectations**

Several efforts to approximate research and policies have had bad results for having been based on unrealistic expectations, wrong definitions and the absence of understanding of the policy-definition process. Expectations have been unrealistic in several senses: many researchers expect others to find use for their research results or expect that the publication of these results might be enough to put them into practice. Decision-makers, on the other hand, frequently expect unequivocal and immediate results and have little patience for probability estimations when what they want are accurate predictions. Even those who wish to assess the impact of research on policy definition tried to do this in an unrealistically short period of time, or used much too limited definitions of the impact that research might have. The next quote from a researcher on policies states this clearly:

*"The results of four interviews suggest that what is typically characteristic such as low use or under-use of evaluation research, might be due, in great part, to a definition of use that is too restricted and does not take into consideration the nature of the decision processes in the majority of programs"* (Patton., et. al. 1977)

The decision process is, in general, wrongly understood by researchers and research analysts because it is subject to multiple forces apart from research itself. Policies are governmental or organizational guidelines on the assignment of resources and desired behavioral principles. Achieving an agreement on these guidelines and principles is, by definition, a political activity, because it requires striking a balance between competitive forces. Empirical data from researchers are but a small force among many others and, therefore, do not have or cannot have the weight they would like to have.

There is also a misunderstanding of the nature of the actors in the decision-making process. According to Lynn policy decisions are made through bargains and compromises between participants with quite different perspectives, through a complex political process (Lynn, 1978). The decision-making process is wrongly understood as a series of decisions made by a given person or a group of "decision makers" who are in charge of that task. Studies on these "decision-makers" show that the majority does not have the feeling that they are deciding; their job is more full of compromises and recommendations than of rational choices based on evidence (Weiss, 1980). Studies also show that there rarely is only one decision-maker in charge of a specific decision (Lindblom, 1986; Lynn 1978).

Apart from the misunderstandings that were already pointed out, another misunderstanding regarding the nature of the decision-making process is the conception of this as a linear process with well-defined

steps in a logical sequence, where each is subject to being supported by research results. An example of a linear conception of this type is shown in Fig.1 (Brownlee, 1992).

Recognizing and describing these ambiguous facts, tensions and compromises might lead researchers and decision-makers to get more realistic and specific recommendations on how and when research might play an important role in the decision-making process on health policies. The following is an attempt to help understand the reason why research is used or not used in this process.

### **The use of research is a complex process**

The literature on the use of research for the definition of policies has a much lesser development in health than in education. One of the most important articles on education in the literature (Weiss, 1979) describes seven different models of how research is used for policies and decision-making processes. They can be classified into three basic groups. One group includes what Weiss calls “knowledge oriented” or “problem solving” models.

These models stress the content of research and represent the researchers’ conventional knowledge of the fact that the political process is rational and that those who participate in this process will make use of research results if available and that they will request research if the decision so requires.

Two other models, described by Weiss as the “political” and “tactical” models have a more strategic character rather than that of the content for the basis of policy design. The political model describes the use of research as support for predetermined positions and not for the orientation to formulate new positions. The tactical model describes the use of research to postpone decisions or to work as a shield while the politicians are in the process of deliberation.

The third group of models stresses the fact that both research and the decision-making process occur jointly with other social processes and cannot be analyzed in isolation.

These three basic groups on the relationship between research and policy-definition are not mutually excluding.

A specific case of use of research results may fit simultaneously into a “problem-solving” model from the perspective of a researcher and as a “tactical” model from the perspective of the decision-maker, given the frequently diverging interests of these communities, with the decision-maker generally being able to accept the ambiguity and uncertainty, that give him room for negotiation, while the researcher tries to struggle against them. These models help to identify the nature of these discrepancies and help the analysts to further understand what type of use of research are they describing or looking for.

## **Research and policies in developing countries: What else do we need to know?**

With the rich variety of conceptual models in the literature that describe the role of research in the definition of policies, some authors say that to continue with the conceptual work is no longer a priority and that what are now needed are descriptive studies that apply the existing models to real situations. Although this might be true for developed countries, analyses on the relationship between research and policies in developing countries require collecting data both empirical and on the development, adjustment and criticism of conceptual models.

Weiss has suggested (1989) that governments in developing countries play a relatively passive role in the acquisition and use of research, a fact that is partially due to factors such as the absence of local data collecting and of processing systems; the recent and foreign origin of such systems; bureaucracies that are poorly receptive to analysis, and government officials who are incapable of understanding or using the analyses in those cases where they have been carried out.

An international comparative study on educational research and policies (Husen T. and Kogan, M., 1984) has identified other determinants for the successful use of research for the policy-making process. Some of these hypotheses are related to individual motivation, to the degree of novelty of the findings and to the context in which the decision process takes place. Other determinants include political stability, the level of political centralization and institutional factors such as the presence of networks and committees of researchers as supporting channels for research.

International comparative studies on decision-making processes related to policy definition should take some dimensions into consideration. In an unpublished article by Weiss (1989), he refers to three of these dimensions: the degree of State centralization or decentralization; the fact that the officials might have received professional training (in law or other relevant areas) and the way in which institutional relationships are structured (if it is a national or federative system, the relationship between the executive and the legislature, etc.). Regarding the relationship between health policies and research in Latin America, it is probably necessary to include additional dimensions in the international comparisons, such as whether the government plays an important role in research production; if the State provides health services; the role and degree of influence of universities and research institutes; the size and capacity of the scientific community and the degree of participation of the legislature and the executive in the development of health policies.

Aside from the policy definition process, the role of research in their implementation process should be analyzed, which involves actors and

challenges that are different from the previous ones. Depending on the content of research results, it is possible to foretell who will be the ones to support or to be against the application of policies based upon those results. Grindle and Thomas (1990) use five characteristics of a possible political or economic reform proposal in order to predict what type of conflict it will give rise to, where the conflict will be located, and what could be done to support the reform. Among these characteristics are who will pay the reform costs, who will get the benefits, what type of technical resources are needed by the reform, whether a wide participation is required, and whether the reform will take a short or long time to be implemented.

To sum up, researchers looking for international comparisons on the use of research about policies identified some explanatory elements such as individual motivation, the presence of networks and committees, the degree of novelty of the contents, the training of the officials, etc., all of which are elements shared by developed and developing countries. In the latter, in spite of these studies being rare, other elements should also be taken into consideration, such as whether the data collection and analysis system is local, the role of the State in the provision of services, political stability, the degree of centralization, circulation of researchers between political and research functions, the types of formal and informal influence, etc.

### **Recommendations for increasing the use of policy research**

Those who wish to increase the use of health policy research in Latin America should focus their attention on the process of disseminating research and the design of health policies. This research on research should try to get to know the different social actors that are involved in the prevention of disease and the provision of health services, such as the consumers and professionals, politicians, researchers, entrepreneurs, clergy, the media, etc. In order to know how to influence each of these actors, it is necessary to know the sources of information trusted by them, what type of information they are interested in, how they evaluate information, what reasons they might have to take specific decisions and who they interact, compete or associate with.

It is important to know whether researchers and decision-makers belong to different factions on a given subject, and if this is the case, it will be necessary to have external connections to promote the relationship between these conflicting groups. If population plays an important role in the definition of policies, making the results widely known and expressed in a clear way will be necessary, although this might be a problem when the media are not trustworthy when handling this type of information or if the educational level is precarious.

A successful dissemination does not require using all the opportunities

and channels. On the contrary, it requires a selection or creation, with a strategic view, of appropriate opportunities and channels. In other words, the dissemination can be a solution to the problem of underuse, provided the knowledge is disseminated to specific clients and under specific circumstances (Knott, J. and Wildavsky, A., 1991). The secret, therefore, resides in selecting the adequate clients and the adequate circumstances.

The idea that researchers themselves are the best advocates for their research is strongly supported by some authors (Porter, RW., 1995). This means that the researcher should have political abilities (identification of interest groups and establishment of allegiances) and communication abilities (to write press releases, make oral presentations) in addition to his regular capabilities as a researcher in collecting, analyzing and writing scientific data. Fortunately not all these capabilities need to be present in a single person, and there should also exist more formal structures and mechanisms that take charge of strengthening the links between research and policy definition. These structures, (councils, policy research institutes, etc.) should translate research results for a wider dissemination; establish a dialog among different actors (brokers), trying to define a research agenda with their participation; promote incentives for researchers to interact with decision-makers, and promote the assessment of research results in cost-effectiveness terms before considering them as the basis of a policy or program, etc.

Knott and Wildavsky are particularly concerned about the problem of early and excessive dissemination of results. They recommend what they call "passive dissemination" (data banks, scientific journals, etc.), rather than "active" dissemination (interviews, press releases, etc.) as a way of increasing the possibility of assessing results and reducing the risk of early application of unverified results. Even bearing these concerns in mind, it is worth mentioning that the contact between researchers and decision-makers need not occur only once the results have been completed. Early contacts with decision-makers at the moment of research formulation may increase the possibility of having a topic that is relevant to the definition of policies, selected by researchers and being considered of use by the decision-makers. In some cases even the bibliography for the elaboration of the research protocol might be a valuable contribution. Additional contacts during the analysis and drafting increase the possibility of the data being presented in a useful way for the decision-maker.

## **Conclusions**

The considerations that are made are based mainly on the literature of the educational sector of developed countries. The extent to which the measures are applicable to the health sector in Latin America is yet to be

seen. This is, at the same time, a deficiency and an opportunity for a research program on research and policies in Latin America that should face interesting challenges, both theoretical and practical. Among these we could have, for example: How can quality and relevance of health research in Latin America be increased in the short and in the medium term? What abilities should health researchers and decision-makers be taught so as to increase their communicative capacities? What form should the research results adopt so as to have a greater impact? And even more important, how can researchers be taught to identify and recognize the relevant actors, the relevant policies and the adequate moments in the decision process where their results may be useful and also used?

Among different strategies to overcome the barriers between research and policies, we could include the wider use of consensus-building methodologies among the different actors involved in the decision-making process of health policies; the inclusion of decision-makers in research advisory committees, as well as on the contrary, the participation of researchers in positions where policy decisions are made; the more intense use of methodologies such as meta-analysis and consensus conferences to overcome the confusion caused by conflicting results; the dissemination of intermediate research products, the development of a fast response capacity and the ability to profit from strategic moments such as government changes to overcome the time barriers; the training of researchers to write research results so that they allow to overcome communication barriers; the creation of a system of incentives so that researchers are concerned by the promotion of the use of their research results.

The long range institutional development, and the advance in the democratization of the decision-making process also play an important role to increase the use of research in policies. Without an educated population and sophisticated journalists, the media cannot function as a good channel for the massive dissemination of research results. Without adequate incentives, health personnel will remain exclusively in their care practice.

Without positions for researchers in government or without policy research institutes that really work, research will speak as an individual voice instead of a collective voice. Without set and defendable priorities, a research agenda cannot be created or sustained.

# CONTEMPORARY TENDENCIES AND CHALLENGES FOR RESEARCH IN PUBLIC HEALTH

## **Introduction**

The field of Public Health is going through a profound epistemological, theoretical and methodological crisis; a paradigmatic crisis as Thomas Kuhn (Kuhn, T., 1970) would say. He made an enormous contribution to the understanding of the historical dynamics of scientific fields, but restricted his concept of paradigm to the field of theoretical production. An important limitation of his conceptualization is that the paradigm crisis would be recognized by the presence of anomalies. In health, for example, the subject of the relationships between health and environment or the problem of stress in the psychosomatic area, would be clear anomalies in the Kuhnian sense. This is not enough, however. A propedeutic of the paradigm crisis should be developed, which should be much more complex than the mere historical inventory of anomalies. This is due to the fact that there are other signs of insufficiency or crisis of a paradigm, that are richer and aim at overcoming it, but that cannot be classified as anomalies.

One of those signs of the paradigm crisis would be the scientific enigma (or paradox). For example, the enigma of planning in health, that is to say, the fact that when planning takes place, important changes do not occur, or these changes do not occur in the expected way, whereas examples abound of cases of intense transformation which occur in absence of any kind of planning. This is a paradox that should be added to the configuration of signs of the paradigm crisis of health. A third element is that of limitations, that is, what can be found outside the application limits of a given paradigm? As an example of these kinds of signs in the field of Public Health, we can point out the subject of social class as a dimension for the health-disease-care processes, because it is undeniable that contemporary epidemiology has difficulties, with its dominant paradigm, to incorporate the discussion on social classes and other fundamental dimensions of society (Breilh, J., 1989, and Laurell, AC., 1994).

Apart from anomalies, paradoxes and limitations, we believe that paradigms might also have blind points as signs of crisis. This means that the paradigms (constituted by the historical agents in an institutional practice) are incapable of seeing. If this argument is applied to the subject and field we are discussing, we believe that Public Health, in its present conceptual development stage, does not manage to refer concretely to the object health. For this reason, those discourses that argue in its favor stating that it is a practice with a scientific basis, convey the impression of being intricate and incomplete; their authors hesitate, invent metaphors, discover indirect ways of speaking about health, but

their object is still disease. To summarize, the object "health" has been a blind point of contemporary research in the field of Public Health.

As we propose to demonstrate further on, the ontological object of Public Health has been constructed following a logic of sets, which is pseudoprobabilistic, monotonous, does not make justice to the richness and complexity of the health-disease-care phenomena. The heuristic object of Public Health, its model-determined object,<sup>6</sup> has been structured by means of fixed hermeneutics, subject to notions that have already been overcome in other scientific fields with greater epistemological maturity, such as the causality doctrine. The result is an object called health which, in fact, refers to "collective disease" and even so, is termed partially and residually as "the risk and its factors".

Therefore, the most crucial challenge at this moment in which the epistemological bases of public health are being discussed is, precisely, the issue of the object "health". This is, as we have already seen, an important (and ironical) blind point of the dominant paradigm in the field of health. The objective of this section is, precisely, to contribute to a semiology of this intriguing blind point, potential model object of a new definition of health in concrete societies, attempting thus, to accumulate indications of epistemo-methodological tendencies for research in health.

### **The "new science" (or: What is happening with science in general?)**

A series of epistemological and methodological elements have been proposed as a possible tendency for contemporary science, which have been grouped under the generic title of "new paradigm". Reference is sometimes made, incorrectly, to this perspective with the name of "chaos theory", which might have more of a marketing sense, because it is neither a theory nor a chaos, as we shall soon see. We think that the term theory of complexity is more adequate to describe the main axis that would partially unite the diverse contributions to a different scientific paradigm.

The complexity theory was developed more systematically by Edgar Morin (Morin, E., 1990). It is a generalized application of the premise that scientific research - contrary to the conventional positivistic approach whose objective is to simplify reality in search for its essence - should respect the complexity that is inherent to the concrete processes of nature, society and history. Several possibilities are suggested as how to define complexity from a more rigorous epistemological perspective (Lewin, R., 1993). First, we can define complexity as equivalent to the plurality of levels or the diversity of relationships between the components of a given model object. Second, the complexity of a model can be understood as its non-finalist nature, that in the conventional systemic language corresponds to the property of feedback of a heuristic model.

In that sense, in its more applied versions, the theory of complexity appears almost as a “neo-systemism”, that updates and widens some standpoints of the general systems theory that had achieved certain influence in the scientific panorama of the fifties and the sixties. For this reason, the phrase “dynamic systems theory” has been frequently used to designate the complex models generated in the contexts of proposals of a different scientific paradigm.

Below we shall attempt to briefly present the main topics and problems which, due to the fact that they are rarely sufficiently articulated with each other, seem to indicate a paradigmatic change in the field of contemporary science.

The most visible characteristic of the so-called “new-paradigm” is probably the notion of non-linearity, in the sense of rejection of the simple causality doctrine which is also present in the conventional approach of science. The use of the Greek term “*chaos*”, that is the equivalent of “disorder”, opposite of the term *cosmos* (that also comes from Greek and means “order”), to describe non-linear relationship systems, indicates that this perspective becomes open to the consideration of paradoxes, something that is intolerable in conventional epistemology, such as the concept of “order departing from chaos”, which we could call Paradox 1 of the new paradigm.

A fundamental theoretical problem of the different paradigmatic perspectives consists in the possibility of thinking that concrete reality is structured discontinuously. This is another way of treating the issue of determination in general: science opens to the possibility of “emergence”, that is to say, the generation of something that is “radically new” in the sense of something that would not be potentially contained in the synthesis of the determinants. Paradox is once more tolerated as an integral part of scientific logic, that we can name as Paradox 2 of the new paradigm: “what is new parting from what already exists”.

In a strictly analytical sense, some basic notions frequently appear in proposals of this kind, that attempt to be innovative in science: “non-linear models”, “strange attractors” and “weak effects”. In general, two meanings have been given to the notion of non-linearity: on one hand, non-linear can mean non-finalistic, recursive or iterative, in the sense of the effect of non-convergent dynamic systems. On the other hand, non-linearity can be associated to the property of relationships between series of events that do not follow the logic of the specific dose-response effect. The notion of “sensitivity to the initial conditions” as an essential property of dynamic systems, opens the path to the explanatory models based on “weak” effects or sensitive (interactional) effects, that is to say, models with a lesser degree of precision or prediction stability that are based on known configurations of factors or determinants. The consideration of the “weak” effects or interaction factors enables the operationalization of dynamic system models in the form of sensitive

point networks which, in our opinion, have a great potential for the health object.

Among the less popularized concepts of the new paradigmatic approaches is the “fuzzy set theory” proposed by Zadeh in the early sixties. This is a critical approach of the notions of limit and precision which are indispensable for the set theory and that are the basis of the formal analytics of modern science (Mcneill, D. and Freiberg, P., 1993).

The “fuzzy set theory” implies a radical criticism to the notion of event as an arbitrary fragmentation of the processes and the transformation of the elements of the dynamic systems, imposing precise limits where there is fuzzy limits, which we shall call Fuzziness 1. Second, the consideration of the fuzzy logic might imply a recovery of contextualization as a stage of the knowledge production process. In this case the external boundaries become fuzzy, that is to say, the interface between the system and the context, conforming what we can call Fuzziness 2. Finally, criticism of the notion of limits also implies questioning the epistemological category of objectivity, taking up once again the classical problem of the observer as effect of a Fuzziness 3, in this case referred to the fuzzy, ambiguous, contradictory and confusing boundary between subject and object.

The application of these principles, methods and logic, that sometimes appear to be incongruous together, has been called post-modern science, specially in Anglosaxon countries. In spite of their evidently renewing potential a critical examination of these approaches indicates a certain “epistemological risk”, particularly for the social and historical sciences: namely the supposed possibility of mathematizing all the relationships that are subject of scientific research, presenting non-linear models as an analytical solution for the cases that do not submit themselves to the conventional explanatory forms.

A methodological reading of these new paradigmatic perspectives does not show a determination of the empirical over the conceptual. That which is conceptual is constructed, it is created through day-to-day research practice, as Juan Samaja teaches us in his master work *Epistemology and Methodology* (Samaja, J., 1994), and does not survive unless in reference to concrete objects. The mere existence of a concrete object does not guarantee nor does it even generate an object of knowledge; however the production of objects of knowledge can generate concrete objects. In the history of science there is an increasing number of examples of generation of concrete objects, as we demonstrate in modern physics (Powers, J., 1982) or even in all the objects of the world of information technology, that is a cybernetic space (the so-called *cyberspace*), a totally created world that now constitutes a reality, in this case, a virtual reality.

We now have to examine those issues within our own specific field of interest. How will the construction of a new science, based on the

previously mentioned elements, affect the object of Public Health? In other words, what epistemological, theoretical and methodological guidelines is it necessary to activate with the announced paradigmatic changes?

### **An epistemological challenge: overcoming false contradictions**

The reconstruction of Public Health at epistemological level goes through the overcoming of false oppositions that rule the issue of knowledge in this field.

Among the most interesting polarities is the polarity between theory and practice. When knowledge starts to be produced at a given abstraction level, people dedicated to the daily practice of services and research have, in general, a strong tendency to reject any kind of critical epistemological discourse. Very often this is manifested in the discrimination between the field of research and the field of services, as if the first were inevitably theoretical and the second exclusively practical. Starting from the supposedly superior position of practice, some wonder what importance theory might have in an eminently practical problem, such as is the health of the population. Right from the beginning, the disjunctive between theory and practice has no logical nor philosophical justification (Althusser, L., 1978). This distinction might be made for ideological reasons, to strike at and fracture the continuity and complementarity that exists between both dimensions (Morin, E., 1990). Considering all that has already been written on this subject, and having even proposed semantic exercises such as theoretical practice or practical theory, it is not necessary to take up this issue again, for the simple reason that this contradiction does not exist.

The polarity between research object and subject departs from the idea that knowledge is produced by a subject that controls and dominates an object, always loyal and respectful of that object which is external to the subject. The center of the research process with this approach is the subject. This is also a case of false opposition, which has already been overcome in all the sciences that have achieved a certain degree of philosophical maturity. When this problem is examined with epistemological conscience, effects of the subject are observed in the object, and of the object in the subject, in a process that Samaja (Samaja, J., 1987) has called "scientific research dialectics". When the research object is not defined as a representation, but as a reference, that which is being proposed is an interaction (in the precise etymological sense of *inter-action*) between research subject and object to an extent in which both positions become relative. At a given moment, that which is subject is differentiated from the object; at another moment, this changes and that which was object becomes subject of a given research process. It is,

therefore, accepted that such a distinction is only operative, that is to say, completely provisional, and only serves to start off the research process. This is the sole use (but not the least important one) of this polarity.

The other disjunctive is that of object and context (the “natural” environment). Context means that which is not produced by the research process. We must accept that the construction of limits is part of our logic: we think like this in a primitive way, but this is only an operation for organizing the world so that we are able to think about it. In fact, there is no ontological or logical guarantee that limits exist and that they are situated where they have been placed because we have placed them there (Castoriadis, C., 1978). The example with the greatest repercussions in the field of Public Health is the limit between what is normal and what is pathological, and therefore, between health and disease. Although much has been written about this, we would like to point out that in nature, in culture, in society, discontinuations appear depending on the vision of the world that the subjects have. “We” (westerners, modern, ethnocentric) are those who think of the objects as discrete objects, in the sense of isolated entities. Whereas, when we have continuity, science is also defined as a specific process to establish limits.

Other polarities follow that are related to each other, that could be grouped in order to treat them more quickly, as individual and collective, person and population, biological and social. All are oppositions that do not incorporate contradictions in the strict meaning of the word, either. In relation to the object of Public Health, for example, there cannot be a contradiction between individual and collective, when we consider the abundant possibilities of integrating generated knowledge to research at individual level in order to structure a collective perspective. These are different levels, but are organized hierarchically. The search for a given “collective project” for health, in spite of being totally fair to the political demands of our times, has unfortunately blocked the conceptual critical capacity and has led to a mythification of the collective milieu, in the absolute sense, and not in a relative sense, at the levels of organization. The same can be said about individual and population. If we take the specific case of epidemiology as an example, our definition of population corresponds more to the juridical and political sciences than to a definition based even on heterogeneous or homogeneous “natural” aspects between the members of a set (in this case a given society) (Samaja, J., 1994). It might even be said, that population is an abstraction, in the measure in which the definition of population operates with homogeneous aspects, and people never are homogeneous.

1. All this leads us to another false opposition, that has mainly blocked the development in the field of social sciences applied to health: The opposition between quantitative and qualitative. There is no point in thinking of a quantity by its own: it is always is a quantity of something.

Quantification is always and solely the quantification of qualities (or properties) as Cecilia Minayo describes (Minayo, MC., 1992). The quantification of qualities, however, not only exhausts the process of knowledge, but it is also secondary to this selfsame process because, in order to have knowledge it is essential to describe an object, that is to say, to recognize its qualities (Granger, GG., 1980). It may also be suggested that measurements are a structured and standardized form of description. It is the description of dimensions, qualities that the researcher, when formulating his/her hypothesis, assumes are referred to a dimensionality and that can therefore be counted or measured, that is, can be reduced to the formal language of mathematics. It is evident that this assumption is not based on the concrete object nor on the properties of that object, but it refers to the properties of the object of knowledge that can be approached by descriptive operations that include quantification, as we already know.

Criticism of the false opposition between qualitative and quantitative also allows us to progress to the deconstruction of the opposition between that which is descriptive and that which is analytical, something that is very popular in the manuals of epidemiology, the main basic science of Public Health. There is, in principle, no science without description. In other words, there is no science without establishing limits, properties (that include their determination), forms and contents of objects of knowledge (Bunge, M., 1974. Samaja, J., 1994), all this operated by the description. Among many misunderstandings with respect to description, I would like to point out the following: description as superficiality, as paralysis and as preanalytical operation (generator of hypothesis). Secondly, the possibility of considering description as paralysis or crystalization, incapable of accounting for the flows of determination (or causality), also lacks sense because processes must certainly be described, from the linear and mechanical ones of causalism to the more dynamic and complex ones of the systemic approach. As to the third misunderstanding, it is enough to say that the logical opposite of the analysis is synthesis, and synthesis is never the description.

As a backdrop, the opposition between the concrete and the abstract is of great importance, because this encompasses all the contradictions that have been analyzed (or de-constructed) in the previous paragraphs. It is a capital methodological problem for epistemology that is sustained in the proposition that science is a social, cultural and historical practice and that, as such, is a game of words (Wittgenstein, L., 1922). In this epistemology, a discussion on the sense of the terms becomes fundamental for the promotion of knowledge on what is formal or conventional and that, for this reason, needs to be object of criticism. In this sense, the opposition normally created between concrete and abstract is also a convention that provokes paralysis. Knowledge cannot be produced without mediations or, in other words, without the mediation of the

objects that are elements of abstraction over the concrete (Samaja, J., 1994). Therefore, that false polarity may be more primitive and relevant in the sense that it is more basic than that between theory and practice with which we started this series.

### **Re-con-figuration of the object “health”**

At a theoretical level, many authors already point at the strategic importance of constructing the object of Public Health. We could add that this is part of a new family of scientific objects, constructed as a totalized and complex object (Morin, E., 1990). To clarify this idea, we propose an analogy (because we consider analogy a powerful and infrequently used form reference of). It is an analogy that comes from a scientific field where prediction is made relative by definition: meteorology, where no one believes in predictions but a lot is said about forecasts. What elements define a hurricane? It is not the measurement of the barometric pressure, nor the strength of the wind, nor the variation in temperature; it is none of these (that can be calculated with a certain degree of precision) but all of them together, united in a whole that is recognized as a hurricane but is not reduced to its measurements. By analogy we could say that the possible object of health-disease-care is, the same as a hurricane, a very complex object that is only defined in its widest configuration, since it has facets, different angles, and the observation of each one of these angles does not give us access to the whole object. We shall call it *integrals of health-disease-care*. Reference can be made to the integrals of health disease-care both in the form of fabrics of sensitive points or metaphores of social representation of diseases, such as in the form of epidemiological structures, chains of causality or risk-production relationships. The logic that can predominate in such possible objects is a multiple and plural logic that cannot be expressed in a codified manner but can only be recognized by its effects.

### **Challenges and tendencies in the methodological sphere**

Within the methodological sphere, the architecture of the complexity of the health integrals (space-population units) must be considered within the architecture of the research strategies and in the selection of data-production techniques. This implies a redefinition of the typology of research structures in Public Health in several ways. There are interesting insemination possibilities of the extensive research strategies, with techniques that have been qualified as qualitative, in processes that we can call methodological hybridization. We can also count on a revaluation of research structures that have lacked prestige up to now, such as ethnographic strategies, case studies and epidemiological studies that have been classified as ecological.

Let us first discuss the case studies. In order to advance here, we have to understand that the definition of case depends on the analysis and interpretation level; a case for the complexity level of a given study, can be the universe for the following complexity level. E.g.: what an individual case is for our epidemiological research, will be the universe of application of knowledge for a clinical approximation, which in turn, is the container of metabolic substances which will be the cases at another level. Conversely, what is a complex populational epidemiological study might be a case to be considered in a wider analysis of the health-disease-care process in society. To summarize, the definition of case depends on the hierarchical level of the complexity architecture of the applied methodology.

The other methodological opening that comes up is what we might call re-engineering of aggregate studies (which are also called ecological studies). There is a very recent movement that values the studies of aggregates, including a discussion on the validity, or better, of the existence itself of the ecological fallacy (Susser, M., 1994. Schwartz, S., 1994). Finally, even within the methodological openings that are already taking place, we observe a reduction in the value of statistical inference as an analytical legitimation source for epidemiology, that is to say, the proposition of including differential analyses where the role of statistics is reduced, and an increase in the importance of mathematical calculation takes place.

### **Epilogue: Openings**

To sum up, there are four key terms for recognizing the openings to a new paradigm in collective health. The first is transdisciplinarity. Only being transdisciplinary - that is to say, amphibious - capable of transversing, passing through different disciplinary fields - it is possible to have the necessary freedom to do so. In that sense, it is necessary to construct the bridges to Critical Epistemology, with the new systemic Biology and with the social health sciences.

The second term is that of complexity. The essential part of the theoretical-methodological issues of a given conceptual program is found in the dilemma between (a) the adoption of a rigorous, systematic and detailed determination through a simplifying abstraction (that of quantification) and (b) the challenge of achieving an effective knowledge of complex totalities, in making this concrete as a problem of collective health. To overcome this dilemma, new strategies at logical and methodological level might be useful, producing "more analytical descriptions" that are capable of stratifying the totalized structures at the diverse integrational levels (Samaja, J., 1994).

The third term is that of plurality. The global changes that we pointed out at the beginning are changes that more than ever indicate that we

have to insist in an attitude of opening to plurality (Santos, BS., 1989). It is no longer an issue of monolythical contributions, of monopolies of thought, of controlled approximations, but of the possibility of knowing what will to come. It is not an issue of eclecticism, it is different, it is much more about the recognition that there is a concrete breach between the objects of object of knowledge, and that the processes that are in one of the levels must be taken as references by the knowledge that is constructed at the other, so that they may be recognized.

The last term is that of praxis. By this I mean that it is necessary to put facts into practice, so that they can be recognized as such. In other words, the facts of collective health are facts like all the facts of human science. These must also be made, and that is praxis. This effort should lead to the construction of new conceptual models, where health is an expression of the living conditions, recovering in this field, the dynamics of social interactions, supporting thus more adequate and effective intervention strategies.

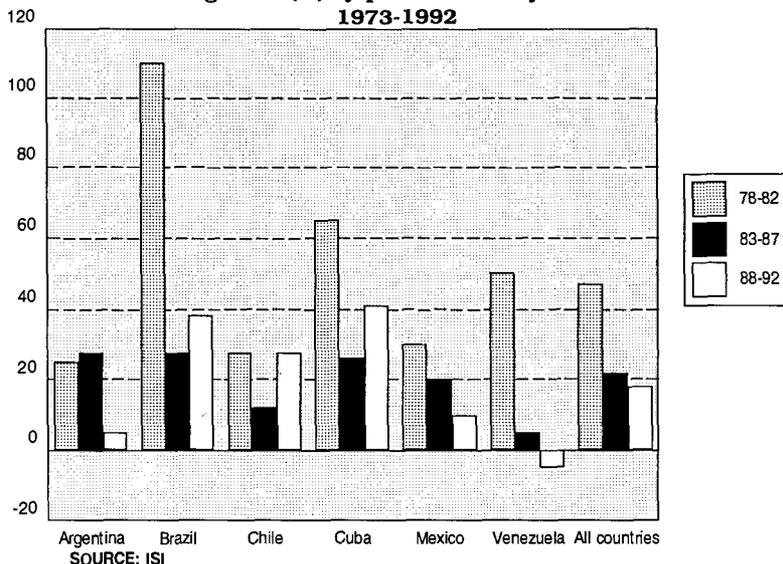
All this renewal in the field of Public Health will favor new forms of conceptualizing and measuring health, and will contribute to the construction of explanatory models with the aim of identifying "sensitive points", where intervention on the health situation will be potentiated. For this reason, it is necessary to overcome the conceptual, methodological and technical limitations of epidemiology and of social sciences applied to health, rescuing its symbolic and concrete efficacy as basic disciplines of collective health (Almeida Filho, N., 1989, 1992 and 1994). The renewal of Public Health practice will reinforce its participation in the redefinition of the organization models and in the transformation strategies of public health in the continent.

There is no doubt that in Latin America we already have a high degree of theoretical sophistication and that we have acquired the methodological potential to participate in this capital effort. What is more, chaos is not foreign to us. We are not prejudiced, therefore, with respect to the non-linear or alternative reasoning modes and the improvisation practices in imprecise situations. In this way, with audacity and vigor, we only have to dominate the technological instruments and make use of our analytical intelligence in order to confront the important historical commitment of making Public Health advance beyond the old paradigms of cause and risk.

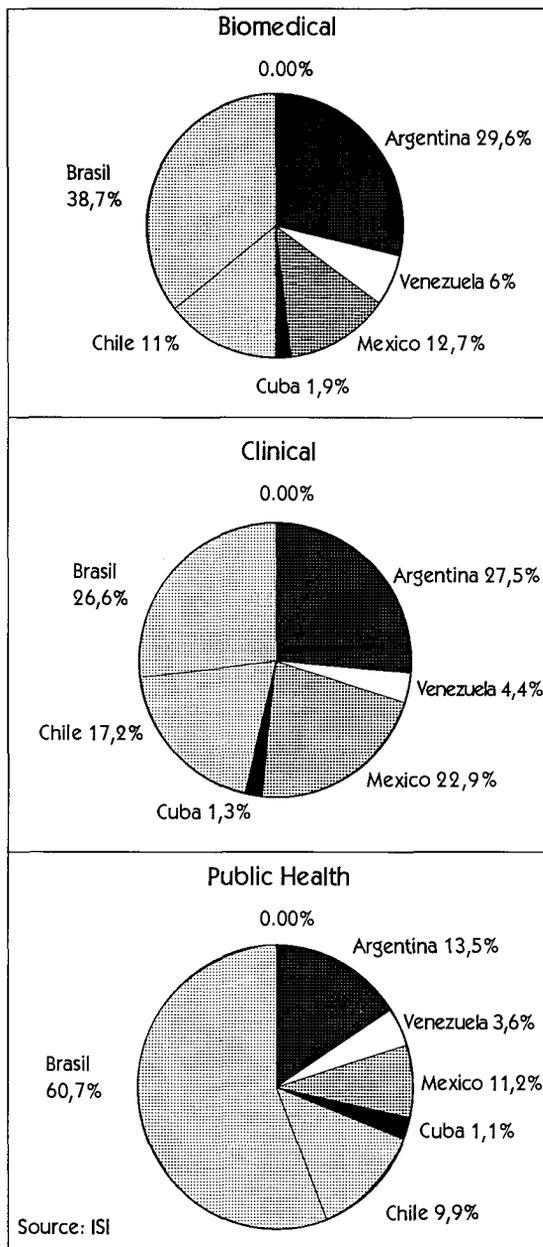
**Table 1**  
**Number of articles published**

<b>COUNTRY</b>	<b>FIELD</b>	<b>73-77</b>	<b>78-82</b>	<b>83-87</b>	<b>88-92</b>	<b>73-92</b>
Argentina	Biomedical	1028	1050	1622	1668	5368
	Clinical	1052	1576	1687	1751	6066
	Pub. Health	41	19	48	41	149
Brazil	Biomedical	749	1366	1946	2947	7008
	Clinical	628	1540	1615	2085	5868
	Pub. Health	47	80	264	281	672
Chile	Biomedical	237	516	554	692	1999
	Clinical	794	821	946	1228	3789
	Pub. Health	18	11	32	49	110
Cuba	Biomedical	37	59	97	145	338
	Clinical	43	77	75	94	289
	Pub. Health	3	0	2	7	12
Mexico	Biomedical	289	446	669	905	2309
	Clinical	1012	1264	1392	1372	5040
	Pub. Health	23	30	31	40	124
Venezuela	Biomedical	215	277	330	264	1086
	Clinical	144	283	256	288	971
	Pub. Health	17	2	10	11	40
Six countries	Biomedical	2555	3714	5218	6621	18108
	Clinical	3673	5561	5971	6818	22023
	Pub. Health	149	142	387	429	1107

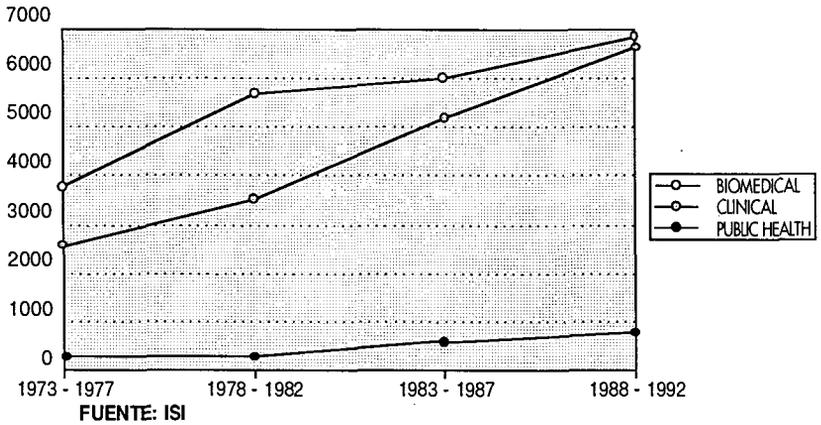
**Figure 1**  
**Scientific production in Latin America**  
**growth (%) by periods of the years**  
**1973-1992**



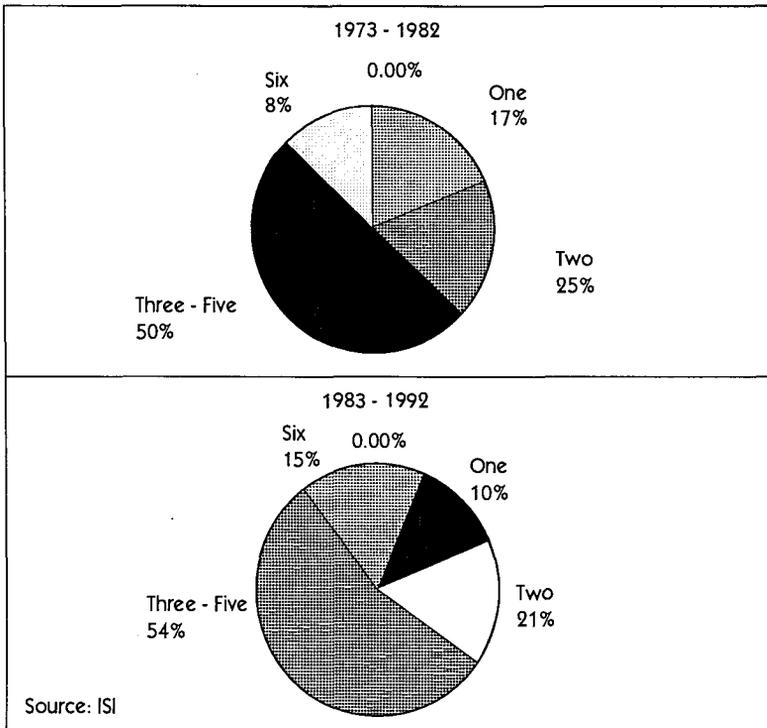
**Figure 2**  
**Scientific production in Latin America.**  
**Distribution by country and by area**  
**1973-1992**



**Figure 3**  
**Scientific production in Latin America and the Caribbean**  
**1973-1992**



**Figure 4**  
**Scientific production in Latin America.**  
**Number of authors per paper**



## References

1. In the area of health, the PAHO/WHO created their Advisory Committee of Medical Research (ACMR) in 1962, and as from the seventies, it started to promote a series of activities in order to support the development of policies in health research (the term S&T in health appears rather late), such as stimulating the creation of units in the ministries of public health which would take care of them, the development of studies on the subject, the strengthening of the scientific and technical information systems, regional planning of health research, etc.
2. This section is based on the report «Preliminary Study on Tendencies of Amounts, Sources and Mechanisms for the Financing of Health Research in the nineties» produced by Lic. Raquel Massacane de Requejo, by contract with the PAHO/WHO.
3. The participation of the private sector in the NES&T in Argentina is relatively low compared to that of other countries. The proportion is 33% in Mexico, 20% in Brazil and 12% in Chile.
4. In the mid-eighties this type of research corresponds to an average of 25% of the S&T costs in Latin America. For the group of the seven most developed countries in the world, this figure is 60% (CEPALC, 1990), a fact that reflects the relative lesser development of Latin America in the research of experimental development, which usually plays a «bridging» role between the research and productive activities.
5. Financiadora de Estudos y Proyectos (Financing Agency for Studies and Projects), linked to the Ministry of Science and Technology, main agency for promoting and fostering technological innovation in Brazil.
6. According to Bunge (Bunge, M., 1972, 1983), the objects of knowledge are made operational in the production or knowledge as model objects, which means forms of understanding, images of something, non specular images, figures that could be capable of instrumentizing the thought about things, process, phenomena and events. Bunge (Bunge, M., 1972) states also that the model objects are of two types: the ontological models and the heuristics models. The ontological models are forms, figures or images that refer to a thing by itself, that is to say, they attempt to concentrate the designation of that thing. For example, risk, health, disease and body are ontological models objects. However, an ontological models objects does not exhaust the organization capacity of knowledge about it nor the possibilities of describing its properties. It is important to prioritize the genetic property of that object, favouring the approach of its determination. The incorporation of propositions on the determination of the object, its genesis, its origin, help the model become heuristic, that is a comprehension model. We could say that the first is descriptive and the second analytical, although this would undoubtedly be another form of reducing the categories descriptive and analytical.

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# ORIGIN, DIRECTION AND DESTINATION OF THE HEALTH TRANSITION IN MEXICO AND LATIN AMERICA\*

*Jaime Sepúlveda  
Héctor Gómez Dantés*

## THE ORIGINS

Throughout the history of mankind we can identify diseases and pests that have appeared and disappeared, and that on many occasions cracked the structure and organization of societies, and sometimes contributed to change the course of history.

The origin of the epidemiological transition appears when the nomads halt and become sedentary. It is at this stage that the first zoonoses appear. When the sedentary inhabitants become merchants, the exchange of the first epidemics, such as measles, influenza and pneumonia begins. In daring to cross unknown borders, merchants become explorers, and with this new role they also introduce malignant fevers, syphilis and cholera to the civilized world.

Once the frontiers of the unknown had been discovered, it was very easy to become a citizen of the world, to transform the local diseases into regional ones and, very recently, to go beyond the regional level to real pandemics and globalization, both of the health problems and the approaches for solving them.

It is thanks to the epidemiological transition theory - derived in turn from the demographical transition theory - that an attempt is made to explain the changes in the health and disease patterns which depend on the demographic, economic and social dynamics. According to Omran, during the development process of every country or region, a series of sanitary changes take place, with a direction, magnitude and temporality that might be considered universal.

The theory describes the transition from a first stage of high mortality, in which contagious diseases become the dominating characteristic of the sanitary spectrum, which then leads to another stage in which the

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infectious pathologies are substituted by chronic-degenerative diseases such as diabetes, hypertension, cancer, mental disorders and lesions.

A specific demographic profile corresponds to each of the described eras. The pre-transitional profile is accompanied by a high mortality rate, high fertility and low life expectancy. The post-transitional profile has inverse mortality, fertility and life expectancy rates.

However, the demographic and epidemiologic transition processes of the different countries do not have a single chronological sequence, nor do they have a linearity nor single directionality. It has also been noted that the existing pathologies in a society do not have irreversible beginnings or endings, and that there is no certainty as to the appearance or disappearance of any disease. Thus, it is possible that, in a given country, different epidemiological profiles may coexist, both among its populational subgroups and in its geographical regions.

This situation has demanded the preparation of new transition models which have received names such as "prolonged transition", "delayed transition" and "polarized transition", for example. In the case of the region of the Americas and the Caribbean, there is no reason to assume that the epidemiological transition will follow the same course as in developed countries and, in fact, some countries are undergoing a "delayed" transition, where the combination of chronic and communicable diseases can persist for a long period, whereas other countries go through the "polarized" model where some of the segments of the highest socio-economic level have already finished the transition while the poorest groups continue to suffer from the classical pre-transitional pathology.

The epidemiological transition describes a substitution process of the infectious diseases as primary cause of death - especially premature deaths - due to the predominance of the chronic and degenerative diseases. The weight of disease has shifted from the younger groups to that of adults, and mainly of the elderly; suffering from a disease is no longer a short process and is starting to become part of our daily existence.

However, the emergence of infectious problems marks new paths for the epidemiological transition with a notable increase in the diagnosis and incidence of old and new problems, both in industrialized and in developing countries.

The outburst of AIDS, sexually transmitted diseases (STD), cholera, tuberculosis, dengue, nosocomial diseases and the imputation to infectious agents of the genesis of degenerative and chronic diseases - the Human Papiloma virus, *Helicobacter pylori* and *Chlamydia pneumoniae*, just to mention some of them - speak of a dynamic process that deserves permanent analysis.

The combination of the general explanatory elements of the epidemiologic transition theory with the elements contributed by classical

epidemiology, administration, sociology, and health economics, can allow the health sciences - for the first time in its history - to predict the sanitary future of a country through the analysis of the global tendencies of its demographic and economic structures, its industrialization profile, its degree of urbanization and the organization of its health system.

## THE DIRECTION

We can link the changes in the health profile to the transformations in the social, economic and demographic areas, and relate them to scientific advances, prevention programs and greater access to health services.

However, a vital substrate that accelerates or delays the appearance of such changes in the health profile is closely linked to what we are, what we do and what we fail to do. Today it is practically impossible to isolate any human activity from a positive or negative impact on health, and what the present categorization in risk groups points out, is the fact of belonging to and/or practicing a certain lifestyle.

The Latin America and Caribbean populations are still living through parallel processes in the social, economic and cultural areas. Technological advances, urbanization, and development models, have attempted to modernize the economic infrastructure but have also made social relationships more complex. The rhythm of such process sets the speed with which changes in the health profile appear and the way in which the transitional process takes place.

At the end of the 20th Century we observe that Latin American societies are no longer rural, traditional societies, closed to changes, illiterate and with authoritarian government schemes but have become urban societies, open to the features of the modern era, more educated and democratic. In this process new values have been acquired and other virtues lost.

The family and social networks have ceased to be the center of support and society has become individualistic, competitive and much more violent. Living together has lost its human and social character and has become automated through the mass media which, in accelerating the pace of information, have broken the myths and incorporated the most isolated communities to the world of technology.

The signs of progress also give indications of deterioration: Green areas have been substituted by environmental pollution, better life opportunities in the urban centers are complemented by unemployment in the big cities, living together has adopted the form of overcrowding and the expectations of better living conditions are expressed in marginalization.

The massification of this vertiginous social process has weakened the customs and the feelings of belonging and favoured migration and unification of some of the fundamental aspects of the culture.

These lifestyles generated from uniform social processes, shared by each country, find almost automatic expression in risk factors for the health of the populations or in conditions that may favour the emergence, reappearance or reemergence of other health problems, especially infectious ones.

A substantial element of this phenomenon on the risk transition, is that the opening up of society broadened the freedom of action of the individual, but without deepening or acquiring awareness of the responsibility of their actions. The voluntary or subliminal adoption of these lifestyles typical of the modern era, are reflected in risk factors of different kinds. The most important ones, because of the direct impact on mortality, are: smoking, alcohol abuse, diet and sedentarism. These four risk factors are linked to a vast complex of pathologies that are characteristic of the post-transitional era and are considered the main causes of death in the population: Cancer of different organs, cardiovascular diseases, diabetes mellitus, accidents and lesions.

Furthermore, the conditioning of lifestyles is accompanied by images that fester the practice of greater risk - especially among the young people - drawing them closer to ways of becoming ill and dying that did not exist or were very limited in the past. Promiscuity as a subliminal element of social dynamics exposes the population to risks such as AIDS, STD, hepatitis B, and pro VPH infection.

Industrialization exposes the working population to new toxic agents, to occupational diseases and to labour accidents. Mental health is another scenario where progress marks its territory even though there are no clear statistics on the magnitude and extension of the problem. Urban violence - linked to the social and economic crisis - has diverse manifestations and is observed in the statistics on accidents, homicides, suicides and lesions, as well as in the growing number of rapes and sexual abuse that, in turn, are also reflected in adolescents' pregnancies, abortions and some maternal deaths.

The transition scenario not only reflects greater risks and a growing number of pathologies and health problems, but is also accompanied by positive influences. Societies have a more positive attitude to health protection and this is expressed in the vaccination coverage, sanitary interventions for the prevention of diarrhoea, consumption of high quality water, refrigeration, promotion of breast feeding, the use of safety belts and the promotion of safe sex with the use of the condom.

This risk transition is taken into account in health statistics, that confirm the shift from the pre-transitional era to the post-transitional stage in the region of Latin America and the Caribbean.

## **The epidemiological transition in Latin America**

Our region is going through a phase of rapid change in its health profiles. The general characteristic of this process consists in the gradual decrease of diseases inherent to underdevelopment and in the increase of diseases that are prevalent in industrialized nations.

There is a dynamic process of demographic change that defines new directions for health in the populations that live in the region. In some aspects the sanitary changes have been far-reaching and manifestly effective in the control of several infectious diseases. General and infant mortality show a clear decreasing tendency, with a simultaneous increase in life expectancy at birth. This shift in the sanitary profile defines new directions for preventive strategies and new challenges to health care delivery, in the confrontation of a new pattern of demand for medical visits, in the causes of hospitalization and death.

The population in Latin America was only 11 million inhabitants in 1700; in 1900 it reached 60 million, it increased to 166 million in 1950 and was estimated at 482 million in 1995. The yearly growth rate of the last period was, in average, 70 times greater than in the first (0.1 million inhabitants per year in the first period, and 7.0 million inhabitants a year in the last one). It is estimated that this population increase will continue up to 676 million inhabitants in the region by the year 2020. In the case of Mexico, the country had a fourfold increase in only 50 years, rising from 19,635,552 inhabitants in 1940, to 81,249,645 in 1990. In 1995 there were a little over 81 million inhabitants and a yearly growth rate of 1.82%, which places Mexico above Argentina which, in the same year, had a rate of 1.22%, Chile (1.62%), Colombia (1.66%), Brazil (1.72%), and below Peru (1.93%) and Venezuela (2.27%).

This growth phenomenon in the region is associated to the annual number of births and deaths. In populational terms, the birth rate in 1950 was 43 per 1000 inhabitants, it decreased to 26 in 1995 and it is estimated to reach 17 in the year 2020. The death rate has a similar decreasing tendency of 15 per 1000 in 1950 which will fall to 7 by 2020.

A striking event of the epidemiological transition in the region is that the differentials between the countries with better indicators, compared to countries with a greater social disadvantage, decrease from one analyzed period to another. For example, the country with the highest birth rate in 1950 had 54 per 1000 inhabitants whereas the country with better standards had a rate of 21. This range (21-54) was reduced to 16-41 in 1995 and it is estimated to reach 13-29 by 2020, with a faster decrease for the countries with higher birth rates. Similarly, the polarization of the mortality rate ranges between the countries of the region fell from 9-28 in 1950 to 4-12 in 1995, and it is expected to reach 4-10 in 2020.

The global fertility rate (GFR) in the region is another indicator of

impact on the demographical transition. If the GFR in 1950 was of 6 children per woman and there were countries with rates of up to 8, in 1995 the GFR was 3. In Mexico, the GFR was 6.75 in 1950, it fell to 3.1 in 1995 and a projection allows us to forecast a rate of 2.03 for the year 2020. The GFR in the continent shows a similar situation for countries like Peru (3.4) and Venezuela (3.3) and more marked decreases in Chile (2.5), Colombia (2.7), Argentina (2.8) and Brazil (2.9).

As to life expectancy at birth (LEB), the region maintains a rising tendency of 51 years of age in 1950, 69 in 1995 and it is estimated to reach 75 by the year 2020. This tendency is very similar in Mexico which had a LEB of 50.8 (1950) that increased to 70.3 (1995) and a projection of 75.3 is expected by the end of 2020. At present (1995) there are important differentials between countries: while Peru and Brazil only have a LEB of 66.0 and 66.3 years of age, respectively, Argentina (72.1), Chile (72) and Venezuela (71.7) have made greater advances in this indicator. The greater life expectancy exposes the population to diverse death risks which are related more and more to the biological age of the individuals and to the uninterrupted social influence on the health condition. If, in the past, deaths occurred mainly at early ages, we observe today that the proportion of deaths in people aged over 65 is quite small. In 1950 only 18% of deaths occurred in this group, in 1995 almost half (48%) the deaths occur after the age of 65, and the projection indicates that by 2020, this group will contribute with 63% of the deaths. The improvement of material living conditions, the decrease in general mortality and the increase in life expectancy have left, as a result, an increasingly aged population that, was 4% of the total in 1950 and will have doubled by 2020.

Another characteristic demographic phenomenon of the transition has been the explosive migration movement from the country to the city, which has determined a considerable increase in the population living in urban areas, which rose from 42% in 1950 to 74% in 1990, and reaching 93% in Venezuela. While the populational concentration in cities increases, the population living in rural areas remains scattered, and it becomes more complex to fulfill the needs and basic services of this population. The big cities and urban centers have become the scenario where the epidemiological transition is confronted to realities and risks that dilate and polarize it.

These new spaces act as catalyzers for the reappearance of infectious diseases, they favour exposure to new environmental, occupational risks, and increase the possibility of dying from lesions or accidents. The mentioned transformation will continue to be reflected in the epidemiological profiles of the region. The new social organization forms inherent to the industrialization and urbanization processes have also produced diverse lifestyles that, added to the growing effect of health interventions, have changed the relative magnitude of the causes of disease and death.

The morbidity and mortality profile has also been modified by specific causes, although the speed of changes varies from one region to another. In general terms, the percentage of deaths due to communicable diseases has been radically reduced, however, the years of life lost due to deaths and handicaps secondary to chronic diseases and lesions, are increasing. While in 1950 36% of deaths were due to gastrointestinal and respiratory diseases, this cause will have decreased to 10% by 2020, whereas heart diseases will have risen from 11% to nearly 39% in the same period.

The infant mortality rate in the region is an excellent example of the implementation of preventive programs with high populational reach and enormous social impact. In the course of a 45-year period, the infant mortality rate decreased from 125 per 1000 to 43, and this decreasing tendency is expected to continue, down to 24 per 1000 by 2020. The differentials between countries show a dramatic reduction in the distance of its indicators, when observing that in 1950 the lowest rate was 57 and the highest 220 per 1000. In 1995 the differential was 8-86, and it is estimated that for the year 2020 this will be 7-48. The most favourable prognosis of this indicator is that the poorest countries will be the ones to achieve the greatest advances in the health of their children, when observing that the contribution of deaths in children under 5 years in 1950 increased to 47% with respect to the total number of deaths in the region, and that in 1995, the figure was 20%, and will be reduced to 7% by 2020.

Infant mortality in Mexico in 1994 was reduced to 30 for every 1.00 live born, similar to that in Colombia (32 x 1,000 registered live born (rlb)), Argentina and Venezuela (26 x 1,000 live born), although it is more than twice the figure registered for Chile (14 x 1,000). At the other extreme we have Brazil and Peru with 57 and 59 x 1,000 rlb, respectively. A similar pattern is found in the case of mortality in children under 5 years of age. However, in the case of maternal mortality, there is a marked contrast in the differentials between the selected countries. The country with the lowest maternal mortality is Chile (34 x 100,000 rlb), followed by Mexico (45), Argentina (52) and Venezuela (63). The rate for Brazil and Colombia increases in both upto 140 x 100,000 rlb live born and, in the case of Peru, the rate soars to 261 x 100,000 rlb. These figures should be taken with caution because the level of under-registrations of mortality - especially those with the highest rates - suggest that the figures might be higher. Whereas in Chile the level of under-registration is non-existent, and in Argentina and Venezuela it is less than 5%, in Mexico it rises to 11%, in Colombia it is 19%, in Brazil 16%, and in Peru, 48%.

Oral rehydration and its impact on mortality due to diarrhoeal diseases is among the sanitary measures that have contributed most to changes in the health profile of the region. The contribution of acute diarrhoeal diseases to mortality in children under the age of 5 (1993) is

increasingly smaller: Chile contributes with only 1% of all deaths, Argentina with 3%, Brazil, Colombia and Mexico with 11% and Peru and Venezuela with 14%.

Another program that has contributed to the displacement of communicable diseases as an important cause of death, is the Universal Vaccination Program. In Mexico the coverage of the complete vaccination schedules in children under the age of 5 has changed; in 1990 only 46% of this population was covered, and in 1994 a coverage of 93% was achieved.

In the case of complete schedules for children under the age of 1, the impact is remarkable. There is a vaccination coverage for each biological of over 90% in Mexico and Chile, over 80% in Argentina and Colombia, whereas in Brazil, Peru and Venezuela efforts are being concentrated on poliomyelitis, tuberculosis and measles vaccination. The intensive vaccination program opens the doors of a new phase of sanitary practice, in demonstrating that it is possible to provide a series of preventive measures to all children, without distinction of age, gender, education and socioeconomic level. The control of the immunopreventable diseases secures the epidemiological transition process and goes beyond the specific control of each disease, because the elimination of measles, for example, simultaneously lowers mortality due to pneumonias and diarrhoeas.

A similar phenomenon is observed in the field of acute respiratory infections (ARIs), because mortality rates due to chronic bronchitis, acute respiratory infections and influenza have been constantly decreasing in the past 20 years. Similarly, the age group that has benefitted most is that of children under the age of five. The ARIs in this group are still an important cause of death in the continent, although with a different weight in the general mortality of each country. In Argentina they contribute with 5% of the total deaths, followed by Venezuela (8%). In Brazil, Colombia, Chile and Mexico they contribute with a percentage that varies between 12 and 15%, while in Peru they contribute 31% of deaths.

On the other hand, chronic diseases such as malignant tumors, diabetes mellitus and cardiovascular diseases show a rising tendency: thirty years ago they were only 8% of all deaths, and had risen to 34% by 1990. The tendency indicates that by the year 2020, this group of diseases will be responsible for nearly 60% of deaths in the region, while accidents and violence will become a first degree problem for public health with an estimated 11% of all deaths by the year 2020.

The most important substrate in the emergence of these diseases is to be found in smoking and alcohol abuse. The percentage of deaths that can be attributed to smoking has increased dramatically in the past 20 years. For example, for lung cancer, it increased from 2 to 6%, and in the case of coronary disease, it rose from 12 to 34%. An acceleration of this

growing rate is expected for the next decade, due to the cohort effect and as a result of the smoking populations of the seventies and the eighties.

On the other hand, while moderate alcohol consumption is associated to certain benefits at the cardiovascular level, its abuse leads to cirrhosis, and its association to accidents and violence exceeds the impact of many infectious agents. It is impossible to deny the strategic economic importance of the industries related to these problems in the lesser developed countries. They are among the few successful industries whose market is experiencing a dangerous increase. Smoking in China and in the East European countries shows a problematic geographical expansion, and at world level, we are living through a process where children and school children are the target of these harmful practices.

The increase in the production and consumption of cigarettes and alcohol has exposed the young population to behavioural patterns that can well revert the advances which - on the other hand - have increased life expectancy, exposing them at the same time to a life that will be accompanied by diverse handicaps.

Although this is a brief summary of the regional epidemiological profile, it must be recognized that it is not homogeneous, and that changes do not occur at the same rate in all the region or within each country. The transition process is very clear in the more developed regions, while in those with a greater social lag, the epidemiological profile indicates that infectious diseases are still the main cause of death.

## **Destination**

This brief synthesis of the epidemiological transition indicates that health care will shortly face a growing population of elderly people, handicapped persons and terminal patients, and that its main activity will be oriented towards health problems that, unfortunately, have been solved up to this day with high-cost technology and with highly specialized human resources. Furthermore, to the burden that chronic and degenerative diseases, and lesions represent for health care delivery, systems must be prepared to confront new challenges derived from environmental problems, drug-dependance and lifestyles characteristic of our times.

The demands of this new health profile differ from those required by infectious problems. In ideal conditions, care of an acute infectious problem is universal and immediate, the general practitioner or family physician solves it at the first level of care, the required drugs are few, diagnosis and support tests are limited and when quality care is offered, patients are seen once or twice again to monitor the course of the disease. Optimistically, we can say that the care of an acute infectious problem is of low cost. Conversely, in the case of chronic diseases, we should point out that care is privileged, belated, specialized physicians are required

at the second or third level of care, multiple medication is required, it is technologically dependent and its follow-up in health centers is almost permanent. From every angle, it is evident that care for these diseases is excessively costly for the institutions and very expensive for the patient.

An enormous challenge for the health systems in the region will be the adaptation to this dynamic changing process. Two lines of action stand out: first, the strengthening of the preventive character of services, and second, the extension of coverage and action strategies to those groups on whom the greatest weight of disease will fall in the medium term.

In the case of preventive action, it is necessary to consolidate the strategies aimed at controlling and even eliminating the infectious problems, such as universal vaccination, oral rehydration, administration of micronutrients, promotion of breast feeding, the use of the condom, among others. In the case of vaccination, for example, it is necessary to strengthen the extension of coverage to new populations and to expand the schedule with new biologicals.

A fundamental challenge for health services is to intensify preventive actions focussed on chronic-degenerative problems through the promotion of early cancer detection in women of fertile age, together with the timely diagnosis and treatment of hypertension and diabetes mellitus.

The Mexican experience shows us that these diseases are detected belatedly and at a stage when the harm and rehabilitation of the patient are consequences that imply a high social, familiar and individual cost.

Another field of action lies in modifying lifestyles - smoking and alcohol - which means to face a powerful industrial publicity, so that educational campaigns should be aimed at lower risk practices such as giving up smoking, moderate alcohol consumption, use of condom and safety belts, or the periodical Papanicolaou smear, for example.

An aspect that should be stressed is that these preventive actions are for a very long-term and that their effectiveness will be felt by the future generations. For this reason health services will face - and in some cases are already facing - a growing demand for specialized medical care, which is costly and situated at the second and third levels of care, with a reduced impact on the health of the population. The immediate satisfaction of this demand should be accompanied by curative and preventive strategies that will have an impact on demand in the long-term. This adjustment has led to the rise of new proposals that are reflected in the global phenomenon described as health systems reform at international level.

The way in which health services adjust to the new health profiles will have to reflect the way in which society will be organized to respond to the new needs of the population. A central element is the vision of health as the engine of social development and, for the same reason, an essential ingredient at the moment of defining the economic policy. The

extension of the coverage of services - especially preventive services - cannot be visualized as one of equity if they are not complemented with investments that fight social injustice. Decentralization of services, universal access and citizen participation (social or private) cannot be separated from the democratization process of Latin American societies. The protection of the most vulnerable groups of society - children and the elderly - must be separated from a paternalistic vision of a scheme that protects the economically active population. Care of adolescents should be linked to strengthening of educational policy, and women's health should become a space where social, educational and economic policies meet.

The direction of the epidemiological transition can be recognized in the health profile of industrialized societies. In these societies there is a predominance of chronic, degenerative diseases and violence; there is a privileged access to health services and a curative approach of care is favoured. This affects the high costs and heterogeneous quality of care that is also regulated by strong legal pressures. This panorama has important gradients, influenced by the scope of social policies of each country.

The destination of the epidemiological transition in the Latin American and Caribbean region -which is still in process- allows the implementation of different cost-effective interventions that change the direction of the transition to a scenario where the focus of attention may be prevention, universal and equal access to services, adjustable costs, with quality of care defined by the users, and where health can be an indicator of life quality and not of years of life lost by our population.

This scenario can be constructed, provided that research is allowed to participate in the definition of the direction with its technological contributions, estimation of risks, identification of cost-effective interventions and the design of applied strategies. In the specific area of epidemiological transition, research covers very diverse fields, from the analysis of the dimension of a health problem, the development of a vaccine, the organization of levels of care, training of health personnel, cost of decentralization of services or the strategies to extend service coverage, and each of these will have a definite impact on the direction and destiny of the transition.

**Health indicators in selected  
Latin American countries, PAHO, 1990-1994**

Indicator	Argen.	Brasil	Chile	Colom.	Mex.	Peru	Venez.
Global fertility rate	2.8	2.9	2.5	2.7	3.1	3.4	3.3
% of urban population	88	78	84	73	75	72	93
Life expectancy at birth	72.1	66.3	72.0	69.3	71.5	66.0	71.7
% of population living in poverty	25	43	29	37	40	57	34
<b>Mortality:</b>							
Infant x 1,000 registered new born	26	57	14	32	30	59	26
under 5 years x 1,000 RNV	30	67	17	42	37	83	31
Maternal x 100,000 RNV	52	140	34	140	45	261	63
% of deaths x ADD under 5 years	3	11	1	11	11	14	14
% of deaths x ARI under 5 years	5	12	14	13	15	31	8
% of under-registration	3.0	26.0	-	19.0	11.0	48.0	4.0
<b>Incidence of AIDS x 1,000,000</b>							
1989	9.0	38.0	6.5	14.3	19.4	5.6	23.0
1993	40.6	86.0	12.9	21.3	56.6	10.5	38.6
Physicians x 10,000 inhab.	26.8	14.7	11.0	10.9	17.0	10.6	16.2
% Population with access to health services	92	75	95	80	89	50	90
<b>Vaccination coverage</b>							
<b>DPT3</b> in infants under 1 year of age	82	69	92	81	91	87	63
<b>OPV3</b> in infants under 1 year of age	84	89	92	95	92	87	73
<b>BCG</b> in infants under 1 year of age	100	87	91	99	98	92	95
Mumps vaccination under 1 year	95	72	93	86	90	75	94
TT in women in fertile age	...	...	...	73	68	48	43

Source: PAHO:Health situation in the Americas, Basic Indicators , 1995

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# HEALTH OF THE AGED POPULATION IN MEXICO\*

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## INTRODUCTION

Populational aging is one of the most remarkable changes in modern civilization and its manifestation determines major challenges in the design, instrumentation and application of health policies both in industrialized and developing countries. The aged population in the world has increased from approximately 150 to 370 million only in the past 20 years. If the trends do not change, by the year 2000, the number of people over 60 years of age is expected to be 590 million. From these, half will be living in developing countries. The increasing number makes us ponder on the serious challenges that this will imply in all the fields of social life, and the possibilities society has of responding to them. One of the first actions is to identify, as accurately as possible, the health and disease situation, the existing infrastructure for medical and social assistance, the volume of available human resources for providing that assistance, and the new requirements that the civilization of the coming century will demand in the mentioned fields.

The health of the aged population is the result of the interaction of several processes that go from the biological and "normal" field of aging, to the cultural and socioeconomic aspects. The latter can, to a certain extent, accelerate or delay the deterioration of the individual and mark, in populational terms, specific characteristics in the fields of health, disease and death to the different human groups.

The present document includes a diagnosis of the health situation, the capacity of health services and the availability of social welfare services for the aged population in Mexico. Furthermore, a series of recommendations are made that could improve, in the short, medium and long term, the quality of life of that population.

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## DEMOGRAPHIC ASPECTS

In 1950 the population aged 60 and over represented 5.6% of the total population in Mexico; in 1990 it was 6.2% and by the year 2030 it is estimated to be 12.6%; this means going from 5,016,000 individuals in 1990 to 17,404,000 by the year 2020 ( Ham, R., 1993).

This change in the populational structure is due to the decrease in fertility and the increase in life expectancy due to the decrease in mortality. The aging process in Mexico has specific characteristics that should be taken into account when formulating specific policies, because there is a female predominance and a greater proportion of the population over 60 lives in rural areas.

## EPIDEMIOLOGICAL ASPECTS

The aging process brings about changes in the health-disease profile of the population in general. In the first place, there is an increase in the chronic-degenerative illnesses and in the disabilities due to the increase in the aged population; there is a shift in the main causes of death and diseases from the younger age groups to the older groups, and, as a predominant phenomenon, there is a substitution of mortality with morbidity (Frenk, J., 1991).. This new situation is characterized by inadequate industrialization and urbanization forms, social injustice, increase in violence and excessive consumption, that are frequently expressed in problems of air pollution, labor and road accidents, mental disorders, consumption of harmful substances such as alcohol and smoking, inadequate nutrition habits and sedentarism (Frenk, J., 1991).

### **Morbidity**

Morbidity in the aged population presents a greater complexity with respect to other age groups, mainly due to the fact that the health condition of that population is the mirror of a whole life period where the effects of diverse processes are accumulated.

According to the World Health Organization (WHO), aging "is a physiological process that begins at the moment of conception and becomes more evident after maturity. Changes take place which result in a limitation of the adaptability of the organism to its environment". (Rocabruno, MJC. and Prieto, JC., 1992). Among the peculiarities of the health of the advanced-aged population, the following can be mentioned:

1. A greater frailty and susceptibility to the environment (social, economic, physical, emotional, etc.).
2. The combination of the effects of aging with the appearance or aggravation of pathological processes.

3. Multimorbidity in the same individual.

4. The combination of non-communicable diseases (diabetes, hypertension, cancer) with communicable diseases (diarrhoeas and acute respiratory infections) and with accidents.

5. The increase in the population with problems of disability or invalidity, due to the appearance of disabling sequelae.

6. Many of the pathological processes of this population were initiated in early stages of life or in adulthood, and are presently found in advanced stages, with complications and sequelae.

### **Morbidity and hospital discharges**

Morbidity, according to hospital discharges, is an important indicator of some of the main problems of the aged population, namely that of a higher social and economic expense. In a study carried out in Costa Rica in 1985 (PHO, WHO, 1990), it was observed that the population aged 60 and over produced more hospital discharges and demanded more medical visits than any other age group. The average hospital stay (14.5 days) was longer than the national average, a fact that implies a high cost for each hospitalization.

In Mexico, the main causes of hospital discharge include both communicable and non communicable diseases and some differences are observed in the distribution by sex (Table 1). More than half the expenses corresponds to non-communicable diseases, and from the 10 main causes of morbidity, communicable diseases are only represented by pneumonias, in both sexes, and by intestinal infections in men.

### **Accidents**

Another important health problem in the elderly population are accidents and falls. In studies carried out in other countries, it has been found that a third of the people aged 65 and over, suffer one fall a year, and as their age advances, the frequency increases (Greenwald, N. and Groat, BA., 1993). According to the data of the Mexican Red Cross, falls were 58.8% of the total accidents treated in the population aged 60 and over; 24.5% corresponded to accidents with tools, and car accidents corresponded to 8.3%. The percentage of people who suffer falls increases with age. According to the National Health Survey (NHS), the incidence of falls in this population, in the 12 months preceding the survey, was greater in women (2.0%) than in men (1.2%).

According to a study carried out in four general hospitals of the federal district (Meneses, F., 1993) in 1989, the main lesions suffered by the population aged 65 years and over were, in men: wounds (31.7%), fractures (29.9%) and bruises (22.1%), while in women, fractures were in the first place (58.7%), followed by bruises (16.5%) and wounds in the

third place (10.7%); these facts coincide with those of hospital morbidity that show that 12.4% of fractures occurred in women and 6.9% in men. This fact could be related to the presence of osteoporosis in the female population, a problem that has not been sufficiently studied in epidemiological terms and that could be prevented to a great extent.

## **Disability**

Disabilities are increasing in Latin America as a result of the change in habits, of the scarce activities undertaken to promote health and the prevention of diseases, the inadequate use of technological resources, the low schooling standards, the inadequate working conditions, social inequality and the increase of violence (PAHO, WHO, 1992). On the other hand, disability represents an enormous economic and social expense, both for the family and for the State. Among the main causes of disability of the aged population, are the chronic-degenerative diseases, accidents and violence. According to data of the NHS (Table 2), 37.7% of people aged between 60 and 69, 45.5% of those between 70 and 79 and 46.5% of those aged 80 and over, suffer from some kind of chronic disease associated to the partial or total limitation of daily-life activities. The leading cause in these cases is acquired disease, and, in the second place, accidents. As to sex distribution, the data show a greater prevalence of these problems in men than in women: 12.5 and 8%, respectively (Table 3).

## **Mortality**

A revision of the 20 main causes of death in the population aged 60 and over in 1990 shows that the diseases of the circulatory system represent 21.11%; followed by those of the digestive tract (non-communicable 13.0% and communicable 3.7%), diseases of the endocrine glands (10.8%), those related to nutrition (4.5%), those of the respiratory system (tumors 2.2% and tuberculosis 1.3%), diseases of the urinary tract (3.2%) and accidents, with 2.3%.

When grouping the chronic-degenerative diseases, it is observed that, overall, they cause 62% of the total deaths and 19% of these correspond to malignant tumors (11.8% in relation to all causes).

## **Mortality of the aged population, distributed by sex**

If we observe the behavior of the same data, distributed by sex, it is striking to see the proportional differences of some causes of mortality, a fact that suggests a determination relationship (biological, socioeconomic and/or cultural) related to sex. Such differences appear in the following causes of death: Among women there is a predominance of diseases of the endocrine glands (12.9%), diseases of pulmonary circulation (9.7%),

hypertensive disease (3.5%) and tumors of the bones, skin and breast (1.2%); while in men there is a predominance of ischemic heart disease (12.3%), diseases of other parts of the digestive tract (9.3%), malignant tumors of the respiratory organs (3.1%) and tuberculosis (1.8%). It is probable that the observed differences will tend to diminish or undergo modifications in the coming decades, with the rapid changes that have been taking place, especially in the reproductive patterns and in the incorporation of women to the labor market.

Given the greater female longevity, there is, naturally, a greater representation of women in the group aged 65 years and over, which increases with age and that has given way to the term "feminization of old age".

This group, compared to that of men, experiences chronic conditions that cause severe limitations to life quality, such as osteoporosis, diabetes, hypertension, arthritis and mental disorders. This situation becomes more severe due to the comparatively inferior capacity of women of having access to and cost coverage of health care services (PAHO, 1990). All these circumstances contribute to situating women in a disadvantageous position with respect to men, in issues of health care and social security. In Latin America older women receive substantially lower incomes than men the same age, and represent, therefore, a higher portion in poverty conditions (within the old population). As a consequence, women of advanced aged constitute one of the more vulnerable sectors of society, marked by poverty, solitude, disease and lack of economic protection (PAHO, 1992).

As to the demand of services, there is data available on hospitals with geriatric services which coincide that 30% of the hospital beds are occupied by people aged over 60; that approximately 20% of the visits are provided to people of this age group, that nurses require 20% more effort than that dedicated to younger patients, that this percentage increases with patients aged over 80, and that finally, the average hospital stay of the advanced-age patients is 21 days.

## HEALTH SERVICES FOR THE AGED POPULATION

Populational aging has particular significance for the health sector, because the elderly frequently shows signs of higher functional deterioration that becomes worse when they suffer from a chronic-degenerative disease, expressed in a greater demand of health services (Gutierrez, LM., 1993).

Geriatric care has focused at global assessment, prevention of disabilities and protection of independence. The objective is the early identification of risk factors or timely signs of deterioration before this takes place or becomes irreversible. There are few hospitals that have a geriatric service, despite the need for the participation of a team of

physicians specialized in geriatrics and gerontology, whose objective should be the functional preservation of the aged patient.

The lack of specialized geriatric personnel and services in the health institutions might favor inadequate care with negative results, both for the patients and their families, as well as the duplication of efforts and excessive squandering of financial resources.

The problems commonly presented by the health institutions where there are no geriatric services are:

1. Premature expenses that generate complications, readmissions and a high probability of morbimortality.

2. Prolonged stays beyond what is necessary, that favor negative physical and psychological conditions.

3. Technified and aggressive treatments that increase iatrogenia.

4. Limited access to health services due to the high costs of gerontological treatments.

5. Outpatient visits, where tests are requested in every visit, a great number of medications are prescribed and on occasions, the return of the patient whose condition does not improve or gets worse (Pichardo, A., 1993).

## TRAINING OF HUMAN RESOURCES

The institutions that train professionals dedicated to the health care of the advanced age population in Mexico at different technical, university and post-graduate levels are increasing in number, but the real demand requires an even larger number of them. There are specialty courses at technical level, and the degree of "geriatrist" given in Mexico is the only one in Latin America. At university level, the teaching of geriatrics and gerontology is precarious with relation to the knowledge imparted to medical students on the topic of aging. At post-graduate level, geriatrics and gerontology are taught at several universities in our country and at hospitals that have this specialty training.

With reference to the training and research in gerontology, several associations foster the development of geriatrics and gerontology in order to gain a better understanding of the problems of the aging individual, and serve as a forum for exchanging medical, scientific and technical knowledge between their members and with other societies in the country and abroad. The Mexican Committee of Geriatrics (created in 1983) establishes the standards for the practice of geriatrics and certifies physicians with specialty training in this area.

## CONCLUSIONS AND RECOMMENDATIONS

The available information on the health of the aged population is fragmentary, it does not approach all the health problems and does not allow, in the majority of cases, to establish periodicity, a fact that hinders the presentation of an integral outlook that encompasses the complexity of the health-disease process of that population. An example of this is the lack of data on dental health, mental health (dementias and depression), comorbidity, nutritional problems, the course of disability-related problems and the perception of the health condition. This situation puts forward the need of improving the collection and systematization of the health information generated at the different institutions (public and private) and of carrying out studies with an integrative approach of the problems of the elderly patient.

### **Morbidity and mortality**

The main health problems of this group are chronic-degenerative diseases. Morbidity due to these diseases increases with age and the prevalence is higher in women. It is also observed, comparing mortality of the years 1980 and 1990, that there is a tendency in these diseases to take the first places (mainly ischemic heart disease, disorders of the endocrine glands, hypertension and tumors of the digestive organs) gaining ground over the communicable diseases. On the other hand, chronic-degenerative diseases are the main cause in the loss of abilities and therefore, of independence and autonomy; therefore, if these increase, we can assume that disability will follow the same tendency. Due to their characteristics, these disorders (they are not curable, they are long-term problems, they require regular surveillance) depend on costly interventions both for their diagnosis and treatment. This puts forward the need for carrying out prevention and promotion programs in health throughout life, both to delay or avoid the appearance of chronic-degenerative diseases, and to avoid the disabling consequences when these are already present.

Another important health problem in this population group are fractures, which are the third cause of hospital discharges and one of the main causes of disability. This disorder predominates in women and increases with age. Prevention and rehabilitation programs, could help prevent a large number of falls and, when these do occur, work could be done to avoid disability.

The relative weight of the groups of causes of death shows no differences in the distribution by degree of social exclusion. However, the rates do have variations. This might be attributed to the use of averages by the federal institutions (which produces a fading in the differences) or to the fact that mortality in these age groups is not determined by the

degree of marginality. The response to the previous hypothesis is not simple and requires deeper analysis of the mortality profile, as well as carrying out studies on the specific situation of this population segment, in aspects such as the life history (work, socioeconomic, family, etc.), life quality, physical and mental condition, frailty, morbidity and co-morbidity among others.

## **Health services**

The general aims of health policy in Mexico are directed at achieving a greater coverage of the health services, at improving the health of the population, at strengthening the primary health care level and at incentivating research and training of human resources, among other things. In this context, the problem of the aged population has been considered very briefly, despite the fact that the delivery of health care is one of its basic needs.

In spite of this great need, the creation of geriatric services for integral assistance has been an isolated effort of physicians interested in the aging process and in health. These physicians started working at the end of the seventies and, nearly 20 years later, they have not increased in number. The objective of the health interventions with respect to aging is that the elderly should remain as functional as possible and have the best possible life quality, and that death should be delayed as much as possible. The objective is that "life should be added to their years"; this is only possible by incentivating the support and the family and social integration of the people in this age group, maintaining and improving their physical and mental condition, trying to prevent diseases, and guaranteeing the care of the patients (Gutiérrez, LM., 1993). When considering the specific needs, a gerontological approach should be used, which consists in the effective combination of the social and health services, with the aim of having the elderly live in their own homes, maintain their functional autonomy and prevent institutionalization whenever possible.

Practical solutions should be sought to offer specialized geriatric care with optimization of the existing human and material resources, before becoming involved in large expenses in new and inoperant institutions. The health of the elderly, the same as the rest of the population, can only be maintained and developed if action is undertaken with relation to the sectors responsible for the social security and care, housing, environmental sanitation, education and recreation.

It is necessary to carry out national educational campaigns which focus on preventive medicine, that generate a sense of responsibility in the individuals with respect to self-care in health and the commitment on behalf of those involved, in providing services with greater dedication.

## **Human resources**

The increase in the aged population is creating a kind of inertia with relation to the demand of specialized care, in particular in the health sector. Training personnel on the knowledge of the aging process of people, as well as on the necessary prevention aspects and the optimal functionality and rehabilitation is a key need. Most professionals with specialty training in geriatrics in Mexico, studied abroad. A small group of these has put forward the idea that the institutions (both educational and hospitals) should train the specialized technicians both at university and at post-graduate level.

It is known that the lack of trained personnel can lead to negative situations for the aged patient, because their frailty and polyopathologies make them vulnerable to inadequate treatments. Premature discharges or prolonged hospital stays, as well as aggressive medications that degenerate in iatrogenias, are only some of the related problems.

The importance of primary care should be stressed, because it is the pillar of all the sanitary services and allows the prevention, early detection and timely treatment of diseases. At this level of care, the medical personnel should also be trained in order to be aware of when to refer these patients to a more specialized level of care.

For these reasons, the health conditions of the aged population, the availability and adaptation of the services and the training of human resources are all factors that require full research and support.

## **Social Welfare**

The institutions responsible for providing social assistance to improve the life quality of those elderly citizen, who are not covered by any institution of social security, have made efforts that somehow solve the needs of some of these groups. It is known that this type of support is not equitable because it often does not reach those in greatest need, either because they are insufficient in number or because people do not know these exist.

Public institutions have opted for providing assistance to the healthy elderly person, who requires social assistance and who, when admitted, is functionally independent. In the case of private institutions, some provide care to the invalid elderly person, but the majority reject this type of person due to the lack of resources and the personnel required for their care. The new institutions in the for - profit private sector, are less selective about the level of functionality or the morbidity of the elderly, but are expensive. Few of these exist at present, and the quality of services offered is practically unknown.

In order to achieve the comprehensive welfare of the advanced age population, it is necessary for the health policies aimed at the elderly to

include clear objectives in issues related to their basic needs and that are oriented at keeping the elderly integrated to the family and society. All this implies that these policies should be closely interrelated to the extension and development of the basic social security and income programs that cover their priority needs.

Despite the fact that in the past decade the family structure and organization has changed, it will continue to be the most important support for those who are aging, and for this reason efforts must be undertaken to strengthen the family, reinforcing it with resources, information and education so that it can support its elderly members. The elderly are one of our greatest riches: it is thanks to them that we have been able to maintain the greatest part of our culture and that we can, today, enjoy an important part of the work and capacities they deployed throughout their productive lives. We are highly indebted to them, but also have the opportunity of paying them back.

**Table 1. Ten main causes for hospital discharges, distributed by sex, of the population aged 60 and over**

Women			
	Cause	Number	%
1	Diseases of other parts of the digestive system	2360	16.3
	Hernia of the abdominal cavity	594	4.1
	Cholelithiasis and cholecystitis	537	3.7
2	Fractures	1790	12.4
	Other diseases of the respiratory system	1509	10.4
4	Pneumonia	498	3.4
	Diseases of the endocrine glands of metabolism and immunity disorders	1480	10.2
	Diabetes mellitus	1248	8.6
5	Cerebrovascular disease	1011	7.0
6	Disorders of the eye and annexes	754	5.2
7	Signs, symptoms and ill defined morbid conditions	583	4.0
8	Diseases of the endocrine glands of metabolism and immunity disorders	498	3.4
	Malignant tumor of the genitourinary tract	425	2.9
10	Other diseases of the circulatory system	369	2.5
	Total	10779	74.7
	All the rest	302	25.6
	Total	14481	100.0
Men			
	Cause	Number	%
1	Diseases of other parts of the digestive system	2376	16.4
	Hernia of the abdominal cavity	1080	7.5
2	Other diseases of the respiratory system	1500	10.4
	Pneumonia	592	4.1
3	Diseases of the male genital organs	1276	8.8
	Prostatic hyperplasia	1169	8.1
4	Fractures	996	6.9
	Diseases of the endocrine glands of metabolism and immunity disorders	915	6.3
5	Diabetes mellitus	872	6.0
	Disorders of the eye and annexes	775	5.4
7	Cerebrovascular disease	701	4.8
8	Diseases of the endocrine glands of metabolism and immunity disorders	530	3.7
	Diseases of the urinary tract	530	3.7
10	Intestinal infectious diseases	461	3.2
	Total	10060	69.6
	All the rest	4390	30.4
	Total	14454	100.0

Source: Statistical Yearbook 1990, Dirección General de Estadística Informática y Evaluación, ssa

**Table 2. Prevalence of chronic diseases in the population aged 60 and over, distributed by cause, sex and age, Mexico, 1986 (%)**

Disease	Men	Women	60-69	70-79	80 and over
Hypertension	6.4	14.2	10.1	11.2	10.1
Arthritis	7.7	12.8	9.2	11.8	12.4
Diabetes	6.1	7.9	7.8	7.0	4.6
Dis. of the heart	2.7	2.7	2.2	3.0	3.9
Brochitis	1.8	2.1	1.8	2.2	2.3
Blindness	2.0	1.7	1.2	2.2	4.0
Deafness	1.8	1.4	0.8	2.3	3.5
Others	5.1	4.9	4.6	5.5	5.7
Total	33.6	47.7	37.7	45.2	46.5

Source: National Health Survey, SSA

**Table 3. Prevalence of limitation of daily life activities (LDLA) in the population aged 60 and over, distributed by cause, sex and age, Mexico, 1986 (%)**

Disease	Men	Women	60-69	70-79	80 and over
With LDLA	87.5	92.0	93.0	88.5	80.0
Without LDLA	12.5	8.0	7.0	11.5	20.0
Acquired disease	6.1	3.7	3.6	6.3	6.7
Accident	1.6	0.8	1.0	1.2	1.9
Operation	0.7	0.3	0.4	0.7	0.8
Invalidity	1.4	1.2	0.8	1.1	3.7
Others	2.7	2.0	1.2	2.2	6.9

Source: National Health Survey, SSA

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# LIFESTYLE AND MODERNITY

*Moisés Goldbaum*

## INTRODUCTION

Contemporary medical-epidemiological literature shows a large volume of publications related to reflections on lifestyle and modernity in the etiological explanation of diseases and their distribution in the different populations. Most articles published in the international journals discussing chronic diseases, reflect the modern tendency to find in this concept the key element to halt or decrease the growing importance that these diseases are acquiring today.

This undeniably relevant relationship has rapidly gained its place both in the scientific community (measured by the amount of research carried out on the subject) and in the diverse social groups and actors, and is being intensely disseminated by the media, namely the written, broadcast and televised media. This fact can be easily verified by the existence in these media, of sections specialized on the issue of HEALTH, where summaries of the most recent articles are published, selected from scientific journals of international distribution, and comments are made on their value, trying to induce, through the scientific validation, a change in people's behavior and habits. (It is interesting to observe that in our Latin American environment, this is frequently the way we hear about publications for the first time, even before receiving the scientific journals in our libraries, a fact that demonstrates the importance given by the press to this topic). On the other hand, this is expressed in the creation of laws restricting the use of products such as cigarettes or alcohol in public places; or even in the regulation on the compulsory use of seat belts when driving vehicles.<sup>1</sup>

The analysis of the topic "Lifestyles and Modernity" necessarily leads to a discussion on the meaning of each of its components, that is, to understand the meaning or sense inherent to the conceptions of the first of the two terms and that which underlies the notion of modernity, especially at a time when we are already speaking of post-modernity. It also implies identifying the moment of its emergence and incorporation

as an epidemiological category and, therefore, as an explanatory element of the health situation experienced by human populations.

It is worth pointing out at this stage that the proposed analysis will be restricted, to a great extent, to the medical-epidemiological aspects, that is, with a greater focus on the area of health itself, and a more superficial approach to the sociological and/or economic aspects. If this might result, on one hand, in a lesser global understanding of the subject, it will not leave aside the interpretation or mechanisms that underlie the construction of those concepts and the direction of the implementation of the logic of the intervention instruments that they promote and justify.

Similarly, the different meanings assumed in the concept of lifestyle will be considered, which, depending on the scope will imply greater or lesser possibilities to propose intervention mechanisms on health. This is essential because very often in the literature, and specially in medical literature, this concept is understood as a synonym of human habits or behaviors that are subject, therefore, to a more directed and oriented intervention. In that sense, reference can be made to at least two articles on this issue (Backett, CB. and Davison, C., 1955, Johnson, M. and Larson. UL., 1995).

In those studies, at least some of the possible ways to define the concept, are made clear. *"...Marx saw lifestyle as superstructural product of position in the economically defined social class structure. Veblen described how the 'leisure class' could be defined by aspects of its lifestyle. However, the concept was addressed principally by Weber who stressed the importance of 'lifestyle' in the evolution and maintenance of status groups. As Abel has pointed out: 'Weber emphasized lifestyle as a means to social differentiation'... In this conceptualization the two basic components of life style were structured conditions (expressed by Weber as 'life chances') and personal choice (expressed as 'life conduct'). In classical theory, therefore, lifestyle denotes an interrelated pattern of conduct for individual, and expression of belonging to a particular group, and some suggestion of structured life chances."*

## ON THE HEALTH SITUATION

The development of societies is undergoing substantial changes in the new social and economic order, and is influenced by the advances offered by the scientific and technological sector, observing their influence especially in its disease patterns and health conditions. Going through the concept of "epidemiological transition" (ET) a first description of these patterns can appear, bearing in mind that this is the subject of another document". In spite of the criticism that could be made of the notions invariably deriving from that concept (ET)<sup>2</sup> - in other words, that the road to be followed by societies will be linearly parallel to that observed in the

more developed countries - this enables an approximate description of the health situation experienced by the different countries.

The first descriptions registered of the human mortality registers, that coincide with the emergence of Vital Statistics in European countries in the XVIII Century (Almeida, 1993), show at the time, a high mortality rate from infectious and epidemic diseases, these being the great concern of that period, and reflecting the existing organization patterns of society. The theories of epidemiological transition reveal that in modern societies, spectacular transformations took place, resulting, according to Terris' expression, in the 1st Epidemiological Revolution, with the control and substantial decrease of these diseases, determined by the advances brought about with the advent of vaccines, antibiotics and by changes in the living conditions, specially in sewage disposal. In this way, the central countries pass from that pattern dominated by infectious diseases, to the experience, in more recent times, of a new standard where there is a higher prevalence and incidence of diseases of non-infectious or non-communicable origin, particularly cardiovascular diseases and cancer. More recently, other diseases due to external causes, like car accidents and homicides have been added to these. (Laurenti, R., 1990) To this we should add the same which is occurring in all parts of the world: new diseases, new challenges like AIDS, and the emerging new diseases that are implanted in their full dynamism.

Together with this shift in the epidemiological pattern, that goes along with and is explained in the History of each of the societies, there are some other characteristics that have become more evident. With the consolidation of Epidemiology as a specific discipline field at the end of the XVIIIth Century (Almeida, F. NA., 1993), a more systematic identification is made of the fact that the described patterns do not follow a supposed regularity in the manifestations of the health-disease process within each social category. Since ancient times it was observed that the different social groups endured the health disease process unequally. In the XIXth Century several authors, representing different conceptions, made dramatic descriptions of the sanitary situation of their time, showing the existing inequalities in living conditions. Chadwick and Engels in England, Shattuck, Griscom, Smith and others in the United States, each in their own way, pondered on the precarious conditions in which different segments of the population lived and their repercussions in terms of morbimortality (Rosen, G., 1994). In these situations, high infant and maternal mortality rates, general mortality, high frequency of diseases requiring mandatory reporting such as typhoid fever, dyphteria, exanthemous typhus, tuberculosis, among others, found fertile ground to mark their presence in the low income groups, exposing them as a consequence to unfavourable life situations, such as "the overpopulation of rented housing,...., lack of light and imperfect ventilation, impurities in domestic economy, spoilt food and

beverages, insufficient sewage, lack of cleanliness in streets..." (Rosen, G., 1994).

This unequal distribution of disease is increasingly attracting the attention, in recent times, of health professionals who, in their attempt to describe them look for their expression and explanation in the social inequality and from these, derive the health situation of different societies and populations. An example of this is the analysis promoted by a group appointed by the British government that, even though it has not yet been signed by the Secretary of State, reveals in some of its details the inequalities found in Great Britain. The document published in 1980 (DHSS, 1980) shows the differences in mortality classified by cause and age group in the 5 social classes (based on qualification levels) that, according to the authors, constitute British society. They look for an explanation and relate it to different material living conditions for each of these classes. Ten years later, in 1990, Morris analyses this report, its development and follow-up; reaffirms the description that was made and concludes his observations evaluating the present situation in England as follows: "The study shows that inequality in mortality, with unacceptably high rates among the poor, will continue, and it is doubtful whether England will achieve the objectives of the WHO (to which it is signatory) and reduce the inequalities by 25% during the nineties" (Morris, JN., 1990).

Recently, in Europe, the World Health Organization promoted a meeting on Inequalities in Health (Illsey, R., 1990), trying to obtain subsidies for the establishment of equity in health and equal access to services, within the objectives of Health For All. Following diverse criteria, tables were made that verified differences in the forms of disease according to social group composition, frequently expressed as "occupational classes". In the process of the discussion and management of the studies that included analysis of mortality and morbidity, an unequal distribution of diseases and/or severity were identified through the stratification of the populations in various categories of the analysis, namely income level, unemployment, ethnic minorities, composition of family group. They also identified that the different population groups based on other variables such as coverage by social security of health expenses, were important elements when defining the unequal distribution of disease. They conclude that there is a need to improve information systems, and especially to work thoroughly on the indicators of social situation, nowadays based almost exclusively on occupational categories, and that this should be refined upon so as to account for the differences found in the distribution of the diseases. As is demonstrated in the course of this paper, these categories are rarely taken into consideration when attempting to understand and explain the Lifestyle category.

Wilkinson (Wilkinson, RG., 1994) and Marmot (Marmot, MG., 1994) add data from their national realities, the former analyzing the

epidemiological transition, and the latter the social differences within and between populations. They promote a revision showing that the relationship between wealth and health is not strictly linear, especially in the rich countries and raise the possibility of psychosocial factors accounting for a higher mortality among those included in the phenomenon described as "relative deprivation". In their quest for answers to the higher incidence of cardiovascular disease and cancer among the poor, they identify, apart from diet and smoking, variables such as: "lesser awareness of work control, lesser qualification at work, a depressed participation in the complex production relationships and lesser capacity to control health". They point out in their analysis the difference in health situation, and that these are not referred solely to the extremes between the rich and the poor, but that they systematically show a gradient in the position of the groups within the population, and conclude that to reduce inequalities, full time jobs and employment, decent and adequate income and a social atmosphere where good social relationships prevail, might be of fundamental importance.

The analysis of the health situation has become the subject of interest of several international organizations, who are attempting to identify and construct more or less complex indicators that explain or justify the varied occurrence of health situations in populations. In general, some studies generated on the basis of those guidelines have tried to reconstruct forms of measuring poverty, and from them, to explain the occurrence of the health-disease process. In several Latin American countries studies can be found that, following these lines, classify poverty in terms of an indicator proposed by the United Nations' Development Program (UNPD), called "Unsatisfied Basic Needs, UBN". Lemus (Lemus, J., 1992), in Argentina and Núñez (Núñez, N., 1994) in Venezuela, show the behavior of infant mortality, of mortality between 1 and 4 years of age, of mortality from infectious and parasitic diseases, reaffirming that the levels of social deprivation (defined by home crowding, availability of drinking water and sewage systems, schooling and income level) determined, according to their greater or lesser frequency, a relationship with the frequency of their dependent variable: studied mortality. These authors understand that these descriptions are conclusive for re-orienting or re-directing the supply of financial resources assigned to covering social needs, trying in this way to minimize deprivations and, therefore, eliminate their consequences and manifestations.

In São Paulo, and simultaneously in Accra - Ghana, a study was carried out that followed the same lines and was oriented by the London School of Hygiene and Tropical Medicine (Stephens, C., 1994). Based on the construction of "scores", defined by the presence of good quality water, housing conditions, income level, schooling level, waste disposal and infant mortality, a perfect inverse relationship could be verified between quality of living and frequency of diseases and deaths from any

cause, a fact that had already been described in the seventies, in São Paulo. It was thus observed that there were areas where quality of living was more precarious and that these were accompanied, in a linear relationship, by higher mortality rates at earlier ages and from infectious diseases. It was observed that these populations had, at the same time, a double tribute to morbi-mortality since they simultaneously showed high mortality rates from chronic diseases and external causes.

The Panamerican Health Organization (PAHO) has studied this subject in two documents, trying to establish some indicators and explanations on the health situation based on living conditions of the populations. The first (Castellanos, P.L., 1992), when discussing a comprehensive explanatory model of living conditions, identifies the determination of health profiles in four large dimensions of the social reproduction process:

- The dimension of the predominantly biological processes. Genetic potential and immunologic capacity.
- The dimension of the predominantly ecological processes. Housing and working environment.
- The dimension of the reproductive processes of conscience and behaviors. Cultural determinants. Habits and behaviors. *Individual and collective lifestyles* (bold type by us).
- The dimension of the predominantly economic processes. The forms of articulation with production, distribution and consumption of goods and services.

Each of these dimensions has a dynamic character that is given by its articulation within the general reproductive process of society and by the internal "conflict" itself that is established in each dimension between the impact of the reproductive processes and the compensating response actions. The balance is expressed in problems of health and well-being (or their absence)."

As an extension of this study, PAHO proposes the construction of a global indicator to describe health situations and makes reference to the measurement of access to social development, adopting the term "indicator of global accessibility to accumulated social development" (IGAASD) which will attempt to express the "historically accumulated accessibility rather than circumstantial changes". Constructed on the basis of five dimensions (accumulated access potential to basic health services, to economic resources, to the schooling system, to nutrients, and to a basic sewage systems in the home) it enables the classification of countries through that indicator as well as relating it to another ("Brechas Reducibles de Mortalidad - BRM", or "Reducible Mortality Gap") which quantifies the excess mortality present in different countries, following the order of this global accessibility indicator (PAHO, 1994).

All the studies that have been mentioned, when including the health situation as their object of interest, look for explanations for the existing

inequalities. From those based on the theories of epidemiological transition to those, as the latter, of a more "integrative" nature, they situate the issue of poverty, in one way or other, as the main determinant of the different health situations of populations, in other words, they promote a "new" reading of that difference, attempting/focusing on interfering or influencing the distribution of the financial resources to give better attention to the health problems, which are localized in the great "least protected" segment of society.

## ON LIFESTYLE

The principle orienting the use of the concept of lifestyle in health and its relationship to the occurrence of disease is mainly determined by the way in which epidemiological methodology organizes its ideas regarding disease causality. The historic pathway of the transformations that marked causal thought in Epidemiology helps to understand the hegemonic movement existing in this discipline and that frequently makes us refer to lifestyle as individual behavior patterns or habits adopted by people, transforming it or confusing it with the term *risk factors*, a central element of current Epidemiology.

The basis for the emergence and consolidation of Epidemiology as a scientific discipline dates back to the end of the XVIIIth century and the beginnings of the XIXth century. The period that marks the process of consolidation and affirmation of capitalism as the hegemonic form of economic production, sees in the Industrialization and Urbanization processes the large and visible repercussions of its social transformation. The newly created order starts demanding the protection of the integrity of large population masses, either to secure the territorial expansion already initiated in the previous period, or to guarantee the accumulation of wealth through wars or the increase of intensive productivity. As a result of this new social organization, a new (not necessarily new from the point of view of its presence) spectrum threatens it - epidemics gain renewed importance, at least from the economic point of view, given their destructive characteristics on the human contingent. They reflect the precarious living conditions to which these large population masses are exposed, which favor the dissemination and expansion of infectious diseases. They generate and create the need to record, in the first place, the number of diseases and of deaths (birth of Vital Statistics) and as a consequence they "produce" the need to develop studies that explain the determinants of their occurrence (birth of the epidemiological methodology), whose great expression - one of them - is found in the excellent studies on cholera by John Snow (Snow, J., 1990).

At that time, when the explanation of the incidence of disease was still based on the theories of miasmas, of intellectual impurity, of magical implications, that is to say, compatible with the existing scientific

knowledge, Epidemiology appears as a modern scientific discipline, based on bacteriological theories (through animate agents - microorganisms) or on environmental aggressions (inanimate agents - physical and/or chemical). The discipline becomes consolidated, with explanations founded on the existence of concrete elements, capable of being isolated and perfectly visible to the human eye. Meanwhile, from the point of view of the explanatory paradigm, it is embedded in unicausal models, reductible to mathematical simple linear functions (Almeida, F. NA., 1992).

It is worth pointing out, that at that time there was a development of different lines in the search for the explanation of the occurrence of disease and, therefore, for establishing health intervention strategies in accordance with the social needs. On one side, movements led by names such as Virchow, for example, who advocated the social explanation in the determination of disease, developed on the basis of Social Pathology, and whose most intense debate took place in some European countries, such as in Germany. Some specific principles oriented these currents of thought. A fragment transcribed from Rosen's study (Rosen, G., 1994) conveys a clear idea of them: *"The first (of the two principles) considered that the health of the population was of direct social interest; society has the obligation to protect and guarantee the health of its members; the second stated that social and economic conditions had an important effect on health and disease, and that it is necessary to subject these relationships to scientific research. Virchow, for example, conceived the scope of Public Health as far-reaching as possible and indicated, as one of its main functions, the study of living conditions of the different social groups and the determination of their effect on health; with this information as a basis, it would be possible to take action. Finally, the **resulting principle establishes that the steps to promote health and fight disease should be social and medical**"* (bold type by us). This became one of the precursor elements of the conception of contemporary Social Medicine; its practical operational application did not correspond with the broad theoretical conceptions that it promoted, and was not present in society, such as occurred with the *Sanitarism* movement, whose operational expressions are found in the actions of traditional Public Health. Quite on the contrary, instead of complementing it, it was "subjugated" and, to a certain extent, prevented from developing fully.

Parallel to the previous current, *Sanitarism* sets its foundations, exclusively around the spectacular and great scientific conquests produced by Microbiology. With the revelation of the "mysteries" of microorganisms, their isolation and visualization, something that had only been imagined chimerically up to that moment (or even denied by many), there is a vigorous renewal of the explanatory paradigms (of unicausality), whose simple linear mathematical functions are applied to the perspectives of highly prevalent diseases recognized as socially

relevant at that period of time. It is at this moment in time where currents of thought advocated the exclusive biological nature of the occurrence of diseases and that the Pasteurian conception is established: "for each AGENT there is a DISEASE and, therefore a VACCINE". Barreto (Barreto, ML., 1990) expresses this as follows: *"with the discovery of the microbe and the definition that the specific etiological agents were the cause of specific diseases, all the epidemiological knowledge accumulated until then on factors related to the occurrence of disease and their social determination undergoes a regression. It is necessary to stress that this is the time of reaffirmation of Positivism, whose influence is felt by all sectors of social life. At a scientific level, the studies of Claude Bernard define the bases of experimental research in biological sciences, decreasing the importance of disciplines with observational predominance such as Epidemiology. In this scenario, the conception of unicity - one specific agent for each disease - is consolidated. Multicausal explanations do not catch on and social determination is completely rejected"*.

In the area of social evolution, with respect to the epidemiological transition, new problems appear that are, also, approached by Epidemiology. The complexity of these emerging problems lead to generating more complex explanatory models that start to experiment with important adaptations. The recognition of this situation takes place with the appearance of new epidemiological patterns as was described previously, whose expressions are given by the marked presence of chronic diseases (especially cardiovascular diseases or cancers) and more recently, of external causes and AIDS. This points out to the need to review those models, incorporating the notion that the explanation of the occurrence of diseases, based exclusively on microorganisms or physical or chemical agents, although necessary, is not enough. Other variables are suggested, amongst which are those of social character, then transformed into personal characteristics. The sole presence of a microorganism or a physical or chemical agent, does not account fully for a complete explanation of the occurrence of diseases. Because of technological innovations such as computer technology it is possible to look for explanations for this new reality, based on multicausality models, and the resulting operational expressions for the application in health control programs: It is enough to point out here and to quote the model of the Natural History of Disease (Leavell, H., 1976), establishing levels of disease prevention as naturalized phenomena, like that of Dever, who tried to reorient the administration of health services (Dever, GEA., 1988), introducing epidemiological reasoning in the latter. Based earlier on simple linear functions, explanations now adopt complex linear functions and even though they offer more comprehensive interpretations, they do not surpass, in essence, the matrix of the unicity models, considering that, from the epidemiological point of view, they maintain the notion of externality and, in certain situations

where there is a specific association and coincidence of variables, situations appear where the biological balance (health/normality) is lost and gives way to disorders in the human organism (disease/abnormality).

It is in that situation that the conceptions of lifestyle should be understood, from a strict epidemiological-methodological point of view (this does not mean that it cannot be applied to other fields of study), which, as we pointed out, marks modern and post-modern life. Understanding this, such as it is understood by our researchers, leads to confusing it with the notion of risk and risk factors, and under certain circumstances, as an equivalent of the disease itself, so that "carrying a given risk factor or belonging to a 'risk group' would have the same effect of any clinical sign..." (Almeida, F. NA., 1992). This becomes clear when, in the before mentioned study by Denver, it is stated that lifestyle means "self-created risks" in the area of leisure activities, in the participation at the workplace and occupational exposure and in the consumer patterns. This allows us for the time being to work with its greater and most frequent meaning, that is habits or behaviors attributed to people; the revision of the concept will constitute, as from this point, a challenge to be faced by health research.

## ON STUDIES OF LIFESTYLE AND THEIR REPERCUSSIONS ON HEALTH

A non-systematic review of the medical-epidemiological studies on "lifestyle" shows a diversity in the approach and methodology and, therefore, in the conclusions, while these are invariably oriented in the same sense and direction. There are, in some cases, discussions probably deriving from the will and enthusiasm with which researchers embark upon problems; take, for example, the recent discussion on the use of beta-carotene as a protection factor against lung cancer.

The Latin American production of international repercussion is specially limited in this field (Pellegrini, Goldbaum and Silvi, 1995), as was already pointed out. In this part all the analyses will be based on "relevant" international literature, understanding that this is applicable to the Latin American reality, at least in the more traditional aspects that mark the understanding of lifestyle (such as smoking, diet, physical activity and stress in their strictly biological conception). This decision is reinforced with the idea that the differences that might be eventually found should only be expressed in terms of intensity and not from a relational perspective, which, as was explained, is referred to the expression of lifestyles as risk factors, such as is understood and misused in epidemiological methodology.

## RISK FACTORS (LIFESTYLES)

A first group of studies attempts, through different procedures, to show the behavior of different population groups with respect to the traditional patterns of lifestyle. One of them (Nagem, JR., Passannante, MR. and Forester, JD., 1990) shows the behavior, beliefs and practice of disease prevention in students from health sciences schools in New Jersey. Thorough data are revealed about them: 99% knew their arterial blood pressure, 68% practiced sports, 78% used safety belts; however 10% were smokers, 3% alcoholics and 10% had already driven cars under the effect of alcohol; 77% did not know their cholesterol levels, and among women, 81% had had breast examination and 79% pelvic examination and 14% had never had a Papanicolaou test done. Although this was quite a selective group, it encourages optimism in the authors who conclude that this is a group which, in general terms is oriented towards prevention and control of unhealthy personal habits. In spite of having good indexes of healthy habits (which is questionable considering the 3% of excessive alcohol consumption), they identify that this can and should be improved, at the same time, it does not confirm the principle "do as I say not as I do", in other words, these students - future professionals - become adequate actors to transmit the notions of healthy habits and behaviors.

Another publication, when studying the use of safety belts (Hunt, DK et al., 1995) analyzed the behavior of patients from a general medicine clinic and found that, among the respondents, 54% did not use safety belts, and concludes on the existence of a "cluster" of exposure to risks. Among these they found a higher frequency of alcoholics, obese and low income individuals (adjusted OR = 1.8 - 2.0), in other words, they identify that unhealthy behaviors tend to accumulate in the same people and, curiously, they state that physicians rarely advise their patients to use safety belts.

The analysis of the behavior of groups exposed to certain factors produced two publications that can be summarized as follows. It was observed that coffee drinkers, compared to tea drinkers, were associated to higher cigarette smoking, of foods rich in fats, and a smaller consumption of fresh fruit, fruit juice and mineral water, as well as less physical activity, when compared to tea drinkers. They conclude that, although they cannot establish the effect of both products on heart diseases, coffee drinkers are more associated to factors that favor them, contrary to what was observed among tea drinkers (Schwarz, Bischof and Kunze, 1994). The same issue of the journal includes an article which studies a randomized cross-sectional sample of smokers and non-smokers, and comes to the conclusion that smokers have a more precarious knowledge of dietary habits, as well as of modifications of personal risks in the case of coronary disease or the intention of

improving their lifestyle. Among other observations on the consumption of salt, antioxidating vitamins, diets rich in saturated fats and alcohol, they suggest that the smoker, apart from the advice needed with respect to smoking, should also be re-educated to improve their diet, and encourage the consumption of fresh fruit and vegetables (Woodward et al, 1994). They confirm, at the same time, the position of the group of researchers who use the notion of association of risks, or sum of factors (clusters) as was referred to previously.

A study carried out by Finnish researchers (Pattala, R. et al, 1994), analysing lifestyle characteristics related to health (smoking, physical activity, alcohol, and food consumption), showed an association (clusters) of these characteristics in groups of 3 or 4 of them. It associates unhealthy behavior to the educational level and verifies that smokers are consistently linked to other unhealthy habits, that is to say, whatever the association of elements, smoking is always present. The authors state, literally, in one of their conclusions that "smoking might be the gateway to an unhealthy lifestyle in general".

According to these studies, it is verified that lifestyle sums up to some great habits/behaviors, namely, smoking, alcohol, physical activity, diet. They do not consider cultural, social and economic aspects that might be influencing these patterns of behavior and habits, and reveal that when one of them is present, there is a high probability of others being present too.

### **On Some Diseases**

Most published studies show different orientations, some were dedicated to clinical behavior, that is to say, an intervention directed more towards the individual, some to more epidemiological behaviors, with an intervention directed at populational groups.

The selection of some of the more recent studies enables the observation of the study tendencies to establish standards for the care of patients with certain pathologies.

#### **\*Cardiovascular Disease (CVD)**

In a review on the control of coronary disease, Simon (Simon, HB., 1994) suggests that the control of patients demands a medical intervention and a change in lifestyle. In this sense he explains the need to stimulate the practice of regular and directed exercise, of vigorously advising to avoid smoking and to try and maintain an ideal body weight. He goes into a detailed analysis of nutritional aspects that should be taken into consideration to modify the nutrition of patients.

A clinical-laboratory standpoint of CVD particularly of the coronary disease, when discussing what is understood by modifiable (smoking,

hypertension, high cholesterol levels, reduction of HDL and diabetes) and non-modifiable risk factors (age, gender and hereditary factors), prescribes an aggressive attitude in the control of plasma factors, apart from a radical intervention for the primary prevention of CVD through the control of the factors that were already mentioned: smoking, diet, physical activity, plus what they call psychological stability (Genest, Jr. J. and Chon, JS., 1995).

Other studies on coronary disease practically reproduce the same analytic matrix and restrict themselves almost exclusively to working with this group of factors in a similar way. They attempt, like in a study carried out in Bahrein (al Roomi, KA., Musaiger, AO. and al-Awadi, AH., 1994), to compare groups of people who have had an episode of myocardial infarction (MI) and a control group. They demonstrate that there is a statistically significant difference as to smoking, physical inactivity, hypertension, diabetes and low consumption of fruit and vegetables, evidently greater in the group with MI. Recently in the Czech Republic (Rosolva, H., Simon, J. and Sefrna, F., 1994) in a study following 3540 men without signs of CVD, it was observed that there is a higher risk: general mortality by age, smoking, high systolic arterial blood pressure, high serum cholesterol levels, body weight and family history; MI is related to age, smoking and high cholesterol levels. They confirm and repeat previous findings, stressing the notion of lifestyle related to the concept of risk factors.

When trying to analyze CVD the different studies - although a thorough and systematic review was not done here - show an extreme coherence and coincidence, involving the idea of common risk factors in any population. When adopting a high-risk strategy, such as is the case, they do not stop to discuss Rose's theses (Rose, G., 1988), who accepts it as advantageous, from the perspective of the individual who has already been recognized of being at a high risk, but does not have the same advantages when applied to the general population where there is naturally a predominance of individuals who are not exposed to the set of risk factors.

#### \* Hypertension (AH)

Some selected studies on hypertension and lifestyle show certain characteristics similar to those explained in the chapter on CVD. Three are of clinical-epidemiological interest and show different perspectives on the management of that disease. When comparing the levels, or better, the frequency of hypertension between two groups of Mexicans, a smaller rate was observed in those who maintained their "roots", when compared to Mexican-Americans. They work with a hypothesis that that difference should be sought in some elements of less modern lifestyle of the poor Mexicans in Mexico City, such as greater physical activity, lower

rates of overweight and lesser intake of food with high levels of fat and carbohydrates (Haffner, S., Hazuda, HP., Valdez, R., Mykanen, L., Stern M. and Gonzales-Villapando, C., 1994). The Mayo Clinic has developed a program on hypertension which, in order to have more radical and effective orientations, finds multidisciplinary groups of professionals to be the best indicator for conducting an adequate medication follow-up of the patients, as well as to modify and guarantee the adoption of healthy lifestyles, thus generating lower death rates (Schultz JF. and Sheps, SG., 1994).

In the field of hypertension related to strokes, a study analyzes the ethnical differences between black and white populations. It is known that there is a higher frequency of these events in the black population. This paper studies the characteristics that were noted to explain this fact and in describing them, casts a doubt on the explanation of lifestyle, access to health services, genetic characteristics, and capacity to respond to medication (Alter, M., 1994). Therefore, they do not find answers in the analysis of clinical questions or in lifestyles.

Although these papers might not be representing all the issues related to hypertension, it could be verified that at least from the clinical-epidemiological perspective, the adoption of the notion of lifestyle is referred to behavior, which can be worked on effectively at the level of clinical-medical intervention.

#### \* Cancer

English researchers have been doing a follow-up of a cohort of British physicians for more than twenty years, and since then, their conclusions have already become classical. Based on their observations, they demonstrate a close association between the habit of smoking cigarettes and mortality from lung cancer in the group of smokers. They also found an association with several other situations in this group, such as a greater mortality from CVD (Doll, R. and Peto, R., 1994). Other group of papers show the same association so that it is already unequivocally accepted. On the other hand, the conviction of this relationship is so strong that it has generated a social movement with radical changes in the conception of smoking, changing from being a "status" symbol, to acquiring today the connotation of a vice, similar to that of illegal psychoactive drugs.

Smoking has been systematically studied as a causal element of all cancers and also of an important group of diseases such as the CVD. Next to the most diverse multiplicity of nutritional factors such as coffee and vegetables, it represents the greatest interest of researchers on the subject. As to smoking, stress is placed on its toxic characteristics, including the passive smoker who, on occasions show a higher risk of developing diseases than smokers themselves. The comparative analysis

of women with smoking and non-smoking husbands, in a nutritional study, shows that the latter enjoy better health conditions (early aging, unhealthy habits, diet) and living conditions (educational standard, housing) (Matanoski, G., Kanchanaraska, S., Lantry, D. and Chang, Y., 1995), assuming once more that smoke is a determinant element and tracer of unhealthy habits and behavior.

In relation to cancers in general, researchers direct their attention to risk factors, some of which have not been well clarified yet. Among these are aspects related to nutrition, evidently smoking and exposure to chemical substances and radiation (Koifman, S., 1995), the latter related mainly to living and working conditions.

#### \* Violence (External causes)

External causes are gaining increasing importance either by their very presence or by the consequences reflected in the resulting morbimortality rates. In some countries, as in Brazil, these are already the second cause of death. Next to traffic accidents, homicides are one of their expressions, and is also found in Colombia and in the large cities of Brazil, Mexico, etc. "Urbanization can be considered a phenomenon closely associated to violence in recent years and not only in the Americas" (PAHO, 1994).

The reason for their emergence and worsening as a Public Health problem has its roots, according to a study developed in Brazil (Souza, ER. e Minayo, MCS., op. cit.), in social inequality and in the climate of conflict and social desintegration found in urban centers. They consider the marked and unfair inequality in income distribution and the growing poverty rates to be the structural core in the determination of this diagnosis.

Many more diseases could be analyzed here. However, in relation to the understanding of lifestyles, the uniformity in all the studies exempts from other details. In order to establish a provisional synthesis, it is clear that the most current interpretation of lifestyles is based on personal habits and behaviors, expressed in smoking, physical activity, diet and emotional tension. At the same time, some papers point to a more structural explanation of its determination, manifested in an inadequate appropriation of wealth and in poverty.

### ON SOME HABITS/BEHAVIORS: FALL IN MORTALITY

The intervention on some of the habits/behaviors has been a constant concern, and its implementation is being sought since the earliest age. In this sense, recent research shows that interventions aimed at the prevention of atherosclerosis could be successful if initiated as soon as possible, at the earliest ages when, according to the authors, patterns in

lifestyles, specially in nutritional habits, are in the process of being defined.

Their observations allow to conclude that it is possible to avoid the increase of serum cholesterol and HDL concentration in children, and suggest that rigorous observance of dietary procedures does not harm their body development.

Several studies show that the fall in chronic disease mortality, specially of cardiovascular diseases in several parts of the world, and raise the hypothesis that changes in lifestyle, together with the adequate use of modern therapy account for this decrease. Apart from detecting an annual drop of 3% in mortality from CVD, a computerized simulation is made, from which it may be possible to conclude that: "younger men, aged 30 to 59 years, might live slightly longer after dietary change, but among women and older men the average benefits would be negligible. The benefits of smoking cessation are more uniform across age and sex and are substantially greater than those predicted for dietary change"(Oberman, A., Kuller, LH. and Carleton, RA., 1994, from Epstein, 1994, Gray-Donald, Abrahamowics & Coupal, 1994)

## TRENDS IN LATIN AMERICA

Some elements are of importance in order to understand the new patterns of the health situation and its determinants, in particular our object, lifestyle. We will, therefore, list some of those that are of particular interest to the different populations in Latin America.

### **Urbanization**

This is a process common to all Latin America and a great movement of populations towards cities has been observed, which has transformed some of them into real mega-cities. Based on recent studies by PAHO (PAHO, 1994.) some of the data which are of importance for quantifying and understanding this phenomenon can be summarized. Since 1950, the region already showed a high urban population index of more than 50%, a fact that was more evident in the Southern Cone. Based on that rural/urban populational inversion, that decade and the ones that followed showed an accentuation in urbanization, both by the founding and rapid growth of new cities and by the marked growth of some capitals, leading to the so-called metropolitan areas. The fact is that in 1995 it is estimated that 74% of the Latin American population is living in urban areas (it must be pointed out that the definition of urban areas is not homogeneous in the different countries), and even more surprising is that from 7 cities with more than 1 million inhabitants in 1950, there is now a total number of 40 cities with that number of inhabitants. Those 40 areas housed 31% of the total Latin American population. Some cities

like Buenos Aires (Argentina), Rio de Janeiro and São Paulo (Brazil) already have populations of over 10 million inhabitants.

Because of the rapid changes in the economic sector of society, this process which is less related to growth, is explained to a great extent by the migratory movements in the rural-urban direction and urban-urban direction (the latter from smaller areas to the larger capitals of the states). This populational concentration, that also implies concentration in services supply, accessibility to education, transport and communications, can be identified, too, with the problems that they share: "congestion and pollution derived from motor vehicles, scarcity of decent housing, disorderly growth of marginal populations in unhealthy areas, increase of violence and drug addiction, rise of urban zones with 'ghetto'-like characteristics." (PAHO, 1994.) These elements are enough by themselves to stress the influence on habits and behavior of people in terms of circulation and the agitated life that is generated, the favorable ground for the expansion of morbimortality from external causes, use of psychoactive drugs, etc. A marked fact in this process makes reference to the tension generated by *migration* and low income that many understand as a factor that generates diseases such as hypertension (Costa, EA., and Klein, CH., 1985) and mental disorders. In the case of the latter it is interesting to follow Almeida's analysis when studying social determination of mental health, and when testing the traditional association between the migratory experience and mental pathology. He finds that the "exclusion from the formal labor market substitutes the migratory experience as a factor associated to mental disease" (Almeida, F. NA., 1989).

Regarding the labor market and changes in the economy, some elements stand out that can be commented on. Using the same PAHO publication mentioned previously, it is observed that employment in non-agricultural activities in 1950 occupied 44%, growing to 74% in 1990. If on one side this might mean there is a lesser exposure to situations that favor the incidence of endemic rural diseases due to living conditions - limited access to services, poor diet, precarious housing and others - it also leads to promoting greater possibilities of increasing employment in small enterprises (that in some studies show their disadvantages due to the problem of safety) and to the growth of the informal sector. Although these variables cannot be considered directly as determinants of the health situation, it is evident that they bring along their worse labor conditions and social rights. The same publication states that employment in small enterprises grew at a yearly rate of 7.5% between 1980 and 1992 and that the employment rate in medium-sized and large enterprises fell from 44% to 31% in the same period. In the past ten years a "deterioration of the purchasing power of salaries was observed, caused by inflation, the delay in readjustments and the lag between the readjustment percentage and the cost of the basic basket.

Employment offers have also decreased (and has been getting dramatically worse in the last years, affecting not only our countries but also some developed European countries). The real value of workers' wages dropped 10% in real terms in the eighties, while the minimum wages and those of construction workers, dropped 15%. This general deterioration of salaries, together with unemployment, have contributed to the growth of poverty" (PAHO, 1994).

The document finishes by showing some of the strategies used by workers to balance their budget including longer working hours, multiemployment, progressive incorporation of other members of the family into the labor market, including minors, women and aged people, having limited access to leisure, education and social participation for time and accessibility reasons.

### **Lifestyle: data on illegal drugs, alcohol and smoking**

According to the information included in the mentioned publication by PAHO, we may have a notion of the magnitude of the presence of these factors in society. When examining the situation in adolescents, it is seen that illegal drug consumption is less than that observed in the United States and Canada. Estimating that between 10% and 30% of all Latin American young people have already had some experience, they note a rising tendency in the consumption in Latin America, as is the case of marijuana in Brazil and of cocaine in the Andean countries. This is a process in full expansion in the region, and ignoring the specific aspects in each country, this increase in consumption goes hand in hand with the wave of violence that makes the authors of the publication express the following: "Smoking and alcoholism in the studied young population is found to be linked to the consumption of chemical substances by their parents. These groups enter a vicious circle where chemical dependence and poverty lead to delinquency, prostitution and other antisocial behaviors" (page 88). They do not, however, analyze the influence of drug dealing as a socio-political-economic process, in this relation and determination.

As to consumption of alcohol and smoking, the same publication reports an increase of both. Alcoholism when initiated in adolescence, is associated to mortality from causes linked to alcohol in the adult age groups. Alcohol consumption has increased very much in the past decade and in some countries like Chile, there has been an increase of 400% between 1958 and 1987 (page 88). The prevalence of alcoholism is estimated to be approximately 5% to 10%, according to the information gathered in some countries (page 268).

"Smoking in Latin America and in the developing world contrasts with the sustained decrease registered in the majority of the developed countries. This increase is seen particularly in young women" This

pattern is obviously not homogeneous for all countries, and there are differences, as to the amount of consumption. In spite of not having records on smoking, it is estimated that prevalence of smokers in the region varies from 30% to 49% in men and from 10% to 29% in women. Campaigns against smoking and coercive laws have apparently had good results among the younger groups in some of the countries.

Information on other elements of lifestyle, such as balanced diets, physical activity etc, is practically non-existent, depending on isolated information which is restricted to groups with some kind of specificity and special characteristics.

## SCENARIOS

In order to understand the subject of lifestyle and modernity two large branches can be worked on.

The first consists in the already established and consolidated line of explanation, the demonstration of which was attempted in the course of this paper, and has to do with understanding the term "lifestyle" as a set of risk factors. On the other side, modernity can be confused with the urbanization process as a generator of those factors. For this option that corresponds, theoretically, to understanding these factors on the basis of personal experiences, there is a whole scheme of intervention aimed at expounding the identified problem at the level of the individual himself or for those groups termed "of high risk", a direct consequence of this explanatory picture.

This type of situation is extensively developed and perfectly fulfills the objectives and mission, that were established for activities in the field of clinical work, whose diagnosis and therapeutic principles are absolutely coherent with the individual level of performance. Therefore, recognizing a citizen who is a carrier of a disease or recognizing that he is being exposed to certain circumstances that can favor the appearance of that disease, gives way to good opportunities to work for the recovery or prevention of a health-disease situation experienced by the individuals. This is what is suggested by all the studies mentioned and the immense production observed in the publications related to the clinical area and to epidemiology. It is worth referring here to Rosen's ideas, repeated in his publications (Rosen, G., 1992), who identifies the following advantages for working with high risk strategies derived from those conceptions: It assures the motivation of the patient or of the "exposed", as well as that of the physician in view of the evidence caused by the exposure, and shows an appropriate and adequate intervention to the individual.

This scenario contemplates all the univocal relationships that are trying to be identified in an evaluation of most of these diseases: Smoking and cancers, diet and CVD, posture and lumbar pain, microcomputer and lesions by repeated exposure (LRE), alcohol and hepatic diseases,

stress and CVD, sexual behavior and sexually transmittable diseases, work and occupational diseases. etc. Modern computer technology facilitates the use of sophisticated statistical techniques (for example multivariate analysis) that enable the analysis of a multiplicity and combination of factors, but, as was described, do not alter the explanatory paradigm of the factor-disease relationship.

The other scenario, which also includes this first one, that is to say, it does not exclude it, encompasses a set of these factors together with a group of elements of a more collective nature.

They can be divided into a level that includes the analysis of environmental factors that can measure the impact of the incorporation of technologies to improve the quality of life, such as sewage technology, and those that are the consequence of the modernization process or unsustainable development, such as environmental pollution (air, water and soils), family "disaggregation" and consumption of illegal drugs in the generation of urban violence, and the dissemination of information through the media and publicity related to these behaviors. These "variables" of a more collective nature have also been studied from a perspective that approximates them to phenomena of aggression to the human organism.

Finally the scenario derived from a structural explanation can be constructed and complemented with knowledge obtained from the previous ones. An attempt is made to explore the explanation of the occurrence and presence of these factors based on their composition in the structure of society itself. It implies understanding them as characteristics of the people and determined at the same time by the dynamics of the construction of the social project. Resorting to such a scenario makes it necessary to work with wider categories that, on one hand increase the spectrum of the "causal" explanation, giving it a more evident transparency and, on the other hand given the present logic, they make the possible interventions seem of little or no operationality. In this sense there are elements such as migration, education, nutrition, employment, housing, work, and their main substitute, poverty, which, given their nature, represent the great challenge for research in the degree that they demand a transdisciplinary approach in order to explain them. Going deeper into this subject does not lie within the scope of this paper, as was explained before, because, among other reasons, it implies mobilizing instruments, techniques and methods that are not within exclusive reach of the author.

The implementation of these three scenarios, providing an explanatory composition of the health-disease process, has all the conditions for establishing an adequate control of human morbimortality. In the attempt to trace the performance environment of each scenario in a linear way (for the sake of clarity) it is possible to identify them in the following summarized way:

The first corresponds to the improvement of clinical activities, in contact with the diseased person himself or with an identified case on the basis of a high exposure to risk factors, including life styles. Examples are unnecessary, since they are the same already mentioned in this paper. There is a movement that expresses this research scenario, which is included in the debate at medical schools with the objective of applying modern scientific methodology to Clinical practice, and that has been inadequately classified by some people with an oxymoron, namely Clinical Epidemiology (Feinstein, RH., Fletcher, SW., and Wagner, EH., 1989).

The critical issue that can be mentioned from these studies, without going into the discussion of their meanings, related to the search for mediations, generally not looked for by researchers, between inferences and conclusions drawn from populational data and their application to the individual as had already been pointed out by Rosen in the papers mentioned here.

For the second scenario, possibilities are opened to recover the performance of traditional Public Health, setting the objective of intervening on populational groups, without having to recognize them as "risk groups". The clearest examples are related to sewage systems and vaccinations, the implementation of which benefit all populational groups uniformly. Therefore, instead of identifying risk groups that could be a reason to go deeper into the differences or existing inequalities between strata, an attempt is made to supply elements that provide without distinction, a better life quality to the whole social group. Apart from the quoted examples, others can be recalled and that have unequivocal repercussion on health: Education and/or information, control and/or fight against the different forms of pollution, etc.

The third scenario, with more comprehensive characteristics, includes the possibilities of actually participating at the levels of decision-making and implementation of governmental policies. To the extent which issues are approached whose main explanation is of a structural nature, this implies that the intervention proposals will also be of the same nature. This does not mean that there aren't other possibilities and interpretations, so that many things considered structural may be considered behavioral, for example, the ways in which migration is interpreted (from a subjective will to a process determined by the needs of economic development).

## CHALLENGES FOR RESEARCH

The challenges for research on the subject of lifestyles and modernity can be deduced from the explanation developed up to now and which, to a certain extent, have already been mentioned.

In the first place, it is necessary to stimulate the development of this type of studies in Latin America, where the major interest is concentrated

on the analysis of infectious and parasitic diseases, to which, in general, the notion of lifestyles has not been applied. Nothing is farther from the truth than assuming that both modernity and lifestyles do not account for their explanation. Endemic diseases such as schistosomiasis, Chagas' disease, leishmanioses, find their causality in the way people live or in the lives they lead; evidently in the presence of the etiological agent, the contact with the human host can be facilitated or hindered by the type of life led by the person. It is enough to recall housing pattern or the forms of labor as determinants for these diseases.

The second challenge is represented by the development of methodologies that respond adequately to the proposed object. If there is an almost "perfect adaptation" between the way of considering risk factors and the clinical intervention and understanding, the same cannot be said of that which is being applied in the populational level, that is, epidemiologically. There has been a successful development of quantitative explanatory techniques that have been of great help for the advance in the knowledge of disease occurrence, but in order to explain the different scenarios it is important to develop qualitative techniques belonging to a set of disciplines, sometimes not adequately considered in the levels of analysis of the health-disease process. This makes it necessary to look for resources in social sciences such as Sociology and Anthropology, and in the sciences that have to do with the economic development of societies. It must be recognized that work has been done with this group of disciplines, but through the systematic juxtaposition of their views, without having found a point of synthesis.

The final challenge is a consequence of this last observation. In order to respond to the necessary synthesis, it is necessary to develop "transdisciplinary" thoughts where the possible objects of study and research might be recomposed in their full integrity. At least a review should be made of the ways by which the different data has been incorporated to the decision-making process for the implementation of health intervention policies.

The development of these studies implies the need to work on some issues pertaining the identification of the process generating lifestyles, especially those of harmful character, in the new organization forms of societies. In this context, to verify how these behavioral patterns are generated and determined by the influence of "consumer societies" on their populations, leading them or promoting strong suggestions for consumption or the practice of unhealthy habits.

Similarly and in this line of open questions, the analysis of the role of family structure should be analyzed and, by extension that of the community in the process of generating or strengthening habits/ behaviors, and describing their potential to explain or maintain the different frequencies of lifestyles. In this sense, it is equally important to record the role of the media in the dissemination of existing knowledge on the adequate health promotion.<sup>3</sup>

The reinterpretation of this knowledge promoted by the press, as well as the massive circulation made by the publicity mechanisms, have significant consequences and influences on the behavioral pattern of populations, demanding more detailed studies on social communication and on its capacity of promoting changes of a positive nature. It should be enough to point out the fascination that actors and actresses in soap operas have on the public, in the sense that the public tends to look for their behavior and desires in the models they represent.

As analyzed previously, the migration phenomenon produces considerable changes in the habits of individuals. The intense urbanization and industrialization process, which has specific characteristics in Latin America, is partly based on the spacial mobility of great populational contingents, conditioning changes in lifestyles, sometimes rapidly, with serious consequences on health, especially in the field of mental health. This is one of the great open questions that deserves support in the search for answers.

The appearance of AIDS, with all its circumstances, demands vigorous continuation of the studies on sexual behavior and the recognition of the changes in the sphere of behavior that should be adequately known and studied.

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1. Only recently in Brazil, did the municipality of São Paulo vote laws banning smoking in restaurants and shopping centers and compulsory use of safety belts, under penalty of being heavily fined; this measure is being adopted now by all Brazilian state capitals. There is also a law in São Paulo that forbids selling alcoholic beverages on state highways.
2. Observing the reality of the peripheral countries, as is the case of the Latin American countries, it is observed that that regularity is far from being configured. On one side, the simultaneous coexistence of high mortality rates due to infectious diseases (these have already been overcome in central countries) and the high mortality rates due to chronic diseases, with extremely high rates of occurrence of external causes. On the other side, however, that which could characterize one of the phases of epidemiological transition is marked by contradictions, conflicts and profound inequalities and, shows the presence and persistence of some diseases in their prime, new outbreaks of others, such as in the case of malaria, and yet the reappearance of others that had already been eradicated/controlled, such as cholera or dengue.
3. A Brazilian magazine (*Veja O segredo do cigarro turbinado* pp. 88-99 May 29, 1996) has interesting article showing the different interests mobilized to maintain the consumption of cigarettes, as well as on the mechanisms used to promote dependence and the repercussions of smoking on health.

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# POVERTY IN LATIN AMERICA

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## INTRODUCTION

The fact that poverty remains mankind's main problem at the end of the twentieth century is not even a reason for controversy. Phrases such as "Poverty is the main cause of death in the world", "Poverty is of course the most important problem", or "The economic and political sustainability of the model is questioned if on the short and medium term there is not a reversal of the regressive historical situations in the distribution of the benefits of growth, which have increased, at least in the initial phase of the reform process", are said by the Director of the World Health Organization, the President of the World Bank and IDB and UNDP professional staff respectively.

These show the importance that the subject of poverty and its growth has, not just for those suffering it, or for the governments of those countries whose populations live under such conditions, but for the whole international system.

It is a growing problem, though according to many authors there are nowadays knowledge and means enough to revert it, or at least to avoid its most devastating effects.

If there is an agreement on its importance, and on the risk it means even for the presently hegemonic economic model, and not much is done to solve it, and what is done is not effective, one could think that knowledge is not as much as we tend to assume.

We shall therefore try to identify some areas needing further research on the subject, stressing particularly its relationship with health, but not centering our discussion in the latter, because in this case it is but a consequence.

## DEFINITIONS

The literature presents different definitions of poverty. This is of more than academic interest, because definitions imply different

quantifications, and therefore, diverse assessments on the process of human development in the countries, and on the policies and resources that are necessary for the social sectors.

As we shall see, most of these definitions are basically operational, looking for the cutting line between poor and non-poor; and we believe that a more "ontologic" (if we may use the word) definition of what being poor means, is still missing.

This does not mean to ignore the existing anthropologic and ethnographic studies, among which the ones by Oscar Lewis (1978) are probably the best known, but there seems to lack an integration of these academic works with those whose objective is policy planning. On the other hand, their findings are not reproducible in the sense of the word in biologic sciences, because each author's theoretical framework bears significantly on the results.

C. Valentine (1979) identifies three different models: one sees poverty as "a subsociety self-perpetuating and endowed with a defective, unhealthy subculture"; another one that sees it as "a subsociety suffering from external oppression, endowed with an imposed subculture and exploited" and a third model for which it is "a heterogeneous subsociety with variable and adaptative subcultures", which to a certain extent means to be a synthesis of the former two.

Kaztman (1988) defines poverty as "the more or less permanent situation of those homes whose insufficient income derives in critical shortages in the satisfaction of basic needs", with which he introduces two of the main problems of the studies on the determination of poverty: the choice between indicators related to income and those related to the satisfaction of basic needs, and the difficulty to measure the duration of the poverty situation.

In the publication entitled "Social Reform and Poverty" (IDB, UNDP, 1993) the authors point out that "In its dual dimension of low income and dissatisfaction of basic needs, poverty is the extreme form of exclusion of the individuals and families from the axis of productive processes, social integration and access to opportunities", thus integrating again the concept of income and needs satisfaction, and adding that of marginality.

There is also a discussion on the adequacy of relative and absolute criteria of poverty.

For some authors, (Sen, 1978, in Altimir, 1992) "There is a core of absolute deprivation in our idea of poverty, which translates manifestations of destitution, malnutrition and hardship, which are visible in a diagnosis of poverty without having to enquire first about the relative situation. The approach of relative deprivation complements rather than competes with this concern about absolute dispossession."

Most of the studies carried out in our continent, yet, have considered poverty with a relative criterion, using one of two methodologies: to set

poverty lines or to identify the degree on unsatisfied basic needs. Altimir, presents the foundation of this choice of methodologies when he states that the concepts of poverty and basic needs "are related to a specific social environment and are referred to the value scale associated to a given lifestyle". so that they are necessarily relative. This relativity makes the comparison in time difficult.

Poverty lines are calculated from the determination of a basic food basket, whose cost is multiplied by the inverse of the proportion taken by food in total expenditures, calculated with the base of those homes whose food expenditure is somewhat higher than the minimum estimate for the satisfaction of nutritional needs, whereas by the criterion of unsatisfied basic needs, homes are considered poor when they do not reach a given minimum in one or more of a number of indicators, in which quality of the house usually weighs heavily.

The definition of poverty lines has additional problems. Altimir, in the publication we have already quoted, points out for instance, that the criteria used by CEPAL in the studies it carried out in the 70's and 80's, have changed, and in some countries they ended up not being comparable.

Kaztman (op.cit) defines poverty lines as the minimum income needed for the homes to ensure the psychophysiologic development and social integration of its members, and points out some problems with the method, particularly, its incapacity to distinguish recent from chronic poverty. On the other hand, the same author mentions that the unsatisfied basic needs criterion is not satisfactory either, due to the time lag existing between a drop in income and a change in indicators of housing or education. He suggests a methodology that crosses both criteria and thus defines four categories of homes: those that are in conditions of social integration, those in a situation of chronic poverty, those in a situation or recent poverty and the homes with inertial lack of certain items. We believe that this suggested classification has potential use for the planning of services and should be further explored.

## IDENTIFICATION OF THE POOR POPULATION

Even if we had a definition on which we could all agree, the question still remains of who are the poor, since only knowing that could focalized policies be developed.

Different classification criteria exist, corresponding to so many other ways of thought: the poor are thus the rural or urban populations, women and children, or the elderly or native American populations, or the unemployed, the structural poor or the new poor, and so on. In the midst of this multiplicity it seems difficult to find the common points, both in the explanation of causes, and the search for solutions.

In the 70's, Pilar Vergara worked on the difficulties of the identification

of the poor rural population of Chile (Vergara, 1975), particularly regarding the choice of indicators that were appropriate for the place, since the classic ones, such as sewage, for instance, have a different value than in the urban settings. At that time she reached the conclusion that (in Chile) rural poverty was concentrated in areas of small land holdings and poor soils and isolation from urban centers. As we see, she brought into play different variables in the identification. She also reached the conclusion that "welfare does not increase at the same rhythm as urbanization, and its impact is truly important only when the urban centers surpass a certain size."

According to CEPAL, the proportion of urban poor out of the total poor population increased constantly from 37 to 55% between 1970 and 1986, while that of the rural poor went down from 63 to 45%. This shows a phenomenon of growing urbanization of poverty, though there is no mention to whether the origin of this population is urban or they had to migrate from rural areas.

The already mentioned paper by IDB-UNDP identifies the new poor, created by the fall in the income level of families that were above poverty lines before the crisis. These new poor include mainly "(i) workers displaced by the modern sector; (ii) unemployed civil servants as a consequence of the reduction of public jobs; (iii) young couples from medium income homes, who do not find a job and have difficulties in the constitution of autonomous homes of similar level to their homes of origin; and (iv) important groups of workers of advanced age, and, in some countries, retired and pensioned people, whose income has been diminished as a consequence of a deterioration in their pensions."

The data about age and sex distribution of the poor population are also insufficient and contradictory. In the countries of the region there are no vital or health statistics that include social class or some proxy to it, with the possible exception of the quality of housing included in population censuses, so that the available information derives from surveys, or data on the utilization of free services, such as health services, but in that case it is easy to have a sex bias in the respondents, (who is more likely to be home) or the frequent users of services, which in younger groups are mainly women. Different authors have pointed out that women and children are particularly affected by poverty (World Bank, 1990). Nevertheless, this conclusion is also affected by the methodology used, particularly in the case of women. So, two studies carried out in Montevideo, (Kaztman, opus cit. and Buchelli and Bjorn, 1994), using the criterion of sex of the head of household, did not find a "feminization" of poverty. Nevertheless, considering the difference existing between the total population and the potential users of the Ministry of Health services, Dibarboure (1996) points out that while in the former the masculinity index is 87%, it is only 73.3% in the latter, and if only the population of 15 to 49 years of age is considered, it falls to 60%.

The information on poverty and ethnic group is even more scarce. It is a known fact that black and indigenous people (though they may not be a minority in some countries), constitute a disproportionate high percentage of the lower socio-economic groups in our continent, but in this case we need also work through proxies, since race is not considered in many national statistic systems. Indigenous populations have been particularly affected by phenomena of destruction of the environment and more or less forced migrations, which are causes of impoverishment and marginality that are often neglected.

## QUANTIFICATION OF POVERTY

Different agencies provide different figures and projections on the number of poor in the region.

According to CEPAL, there were 183 million poor in Latin America and the Caribbean in 1989, which equals 44% of the total population, with an increase from 110 million in 1960 to 170 million in 1986. The annual rate of growth in the number of poor was, according to that agency, of 0.3% in 1960-1970, 2% in 1970-1980, and 3.6% in 1980-1986.

According to the same source, the national incidence of poverty was estimated to be 51% of the families in 1960, 40% in 1970, 35% in 1980 and 37% in 1986; while in the total population, the national incidence of poverty increased constantly in the period 1970-86, from 40 to 43%. Data published by the Pan American Health Organization (PAHO, 1995) on the percentage of poor in the population show a range from 11% in Uruguay to 80% in Haiti. This information is not available for many countries in the region.

On the other hand, according to the World Bank there were 70 million poor in Latin America and the Caribbean in 1985 (113 million less than CEPAL), with an incidence of 19% (CEPAL, 43%). This difference is due to the fact that the Bank used a universal poverty figure of US\$ 370, lower than that used by CEPAL.

According to Altimir, most countries experienced during the decade of crisis, strong income redistribution processes, with regressive results. The relation between the 20% with the highest income and the 20% with the lowest one, varies, according to data published by PAHO, from 7 to 1 in Uruguay to 32 to 1 in Brazil.

These figures are important enough to make the IDB/UNDP experts say that "Though poverty is no new phenomenon in the region, and its ultimate origin lies in a historical pattern of growth with inequality, figures show a worsening in living conditions of ample segments of population": (IDB/UNDP, op.cit)

The same source recognizes that the region has now more poor people than at the beginning of the 80', both in absolute figures and as a percentage of the total population. More people have incomes below

poverty lines, and the percentage of those who do not cover their basic needs has grown.

In recent years, too, the region's societies have seen a worsening of historical problems of income distribution, productive assets and opportunities. According to a UNDP Human Development Report, Latin America and the Caribbean, despite having a general level of development that compares favorably to other developing regions, shows a greater disparity when income distribution is considered.

According to the IDB/UNDP, those families in the poorest 20% of homes, generally correspond in the Region to the category of extreme poverty and their income from labor represents only about 2% of the GNP of their countries.

Having said this, we should mention the weight of Brazil in the region. A reduction in inflation rates or unemployment in that country is reflected in a substantial decrease in poverty indicators for the whole region.

## THE CAUSES OF POVERTY

The causes of poverty is a motive of discussion for economists, social scientists, sociologists and politicians. Different explanations are given according to each author's political and philosophical outlook.

For Marx (1867), on whose works are based those of many other authors, the model of capitalist accumulation constantly produces a surplus of labor, excessive for the needs of capital exploitation, which becomes a "reserve industrial army", so that the generation of poverty is inherent to the model.

That is why Griffin (1984) states that "Countries....can only become underdeveloped, that is, structurally impoverished, as a result of forces that are peculiar to a capitalist system."

Raúl Prebisch, (1981) who developed the discussion on international dependency theory in the capitalist system, used to say that "in the spontaneous course of development, the periphery tends to fall aside of the industrialization process in the historical evolution of capitalism. More than a fate of exclusion, this phenomenon is the consequence of the action of market laws at the international level." According to this author, in peripheric capitalism societies, income structure does not evolve in a manner that is coherent with the technical and occupational changes, and the fruits of technical progress are only transferred to a limited proportion of the labor force which, above all due to its social power, has been able to attain the ever higher qualifications demanded by the techniques.

The International Labor Organization (ILO, 1981) when discussing rural poverty states that "the distribution of goods, mainly land, is the main cause of the degree of rural inequality and poverty".

Helio Jaguaribe (IDB,UNDP, op.cit.), chooses a different approach, and identifies three origins of poverty, thus apparently assuming the existence of more than one cause and modality:

“ (i) that poverty that is the product of the basic duality of Latin American societies, (ii) that poverty that is the effect of neoliberal adjustments, not compensated enough, and (iii) that poverty that is caused by the persistence of agrarian societies of primitive economy, that are subject to violent exploitation by the landowning oligarchies or their descendants.” He states, nonetheless, that most of the Latin American poverty is due to social dualism.

The papers of international agencies generally assume a “contemplative-descriptive” attitude, not daring to go into the causes of actual poverty situations. That is how the IDB affirms that “... the crisis of the eighties found the Latinamerican countries with great delays from the social viewpoint. The crisis showed again the inequitable structure of Latinamerican societies, since most of the adjustment costs fell on the low and medium income groups.” Further on, the same paper points out the fact that “the deep roots of poverty in the region arise from the insufficient economic surplus, its inequitable appropriation and the dissatisfaction of basic human needs, originated by an inadequate structure of supply and demand of means for their satisfaction”, not going into the causes of this non-existence of surplus, of the inequitable distribution or the lack of satisfaction of basic needs.

Mr. Enrique Iglesias, IDB President, tries an explanation based on other elements not usually considered, when he says that “... the classic production factors- capital, labor and land - are elements that only partially account for the generation of wealth. In a recent OECD report, it is pointed out that the so-called classic factors of economic growth account for only 50% of progress, and that all other elements, which have been considered residual, acquire ever more importance”. The three residual elements that he points out are education, agrarian reform and good government.

Other authors also choose not to consider the causes of structural poverty and to pay special attention to the motives of the deterioration of the situation in recent years, and its relationship to the adjustment processes to which the region economies have been subject.

In that context, Altimir, (op.cit) says that “...i) The recessive adjustments of the early years of the decade, (of which only Colombia was exempt) had negative effects on income distribution, at least in the urban areas. The magnitude and duration of external shocks have had an important role in it, as shown by the cases of Argentina, Costa Rica and Venezuela. ii) The degree to which those effects have later deepened, consolidated or reverted, would have been determined by the attainment of durable macroeconomic stability and recovery or sustained growth,...iii) In an environment of stability and growth, the hierarchy that the objective of

equity may have in the design and application of economic policy, has an influence on the distribution results....iv) The three cases of reform of the economic policy regimen during the period (Chile, Costa Rica and Mexico) were accompanied by a worsening of income distribution..."

The effect of economic growth on equality in developing countries is much discussed. On this point Altimir says that the results of his research on the dimension of poverty "would seem to contradict the hypothesis that inequality increases with economic growth, and also that it is more likely to increase if growth is faster."

An interesting contribution is his conclusion that poverty clearly falls with economic growth, from a threshold of around 3% per annum per capita. The existence of this threshold poses a whole series of research questions, including its very existence.

Beyond the diversity of opinions, it is urgent to know more on the mechanisms that have generated in the past and still generate today, in growing quantities, poverty at a time when mankind has enough technology to ensure the satisfaction of basic needs for all its members. Economic models have changed through history, however slow that process may have been, so that the idea that structural evils are "eternal" seems nonsense. The elaboration of an alternative model, based on sustainable development, with an equitable distribution of the burdens and surpluses, seems to be the main challenge for the end of the twentieth century.

## HEALTH SITUATION OF THE POOR

Although this subject is dealt with in another paper, we must point out that the health problems of the poor population are varied. In a country such as Uruguay, where though few children are born, over half of them do it in a situation of poverty, mother and child health acquires special relevance. Differences in health indicators are a consequence of socio-economic disparities. Hugo Behm (1979) pointed out the importance of social class as a determinant of mortality. Due to the disparities of the region, although infant mortality was 41/1000 in 1994 for the whole continent, the range varies from 10/000 in Cuba to 98/000 in Haiti.

Living conditions of the poor, particularly their malnutrition and bad housing, increase their chances of acquiring communicable diseases. In fact, the continent is witnessing the reappearance of diseases that seemed to be under control, such as T.B. and cholera, which are directly related to socio-economic conditions. In 1994 there were 1:113.550 malaria cases reported in Latin America and the Caribbean and 114.476 cholera cases. To these we add the growing prevalence of chronic and degenerative diseases, due to the aging of the population, but also due to stress and unhealthy lifestyles that the poor must necessarily lead. Life adjusted mortality rates (per 100.000) have changed, for

cardiovascular diseases from 171 for males and 207 for females in Central America to 269 and 316 in Brazil, for instance, while that due to communicable diseases decreased from 70 for males and 64 for females in the Southern Cone to 269 and 264 in Central America, (PAHO, op.cit)

A high percentage of the poor are unemployed or sub-employed. The relationship between employment and health has been the object of different research, and the World Health Organization published a book, "Health policy implications of unemployment", in 1985. Different authors mention psychologic problems, particularly depression, and an increase in the number of visits to the health services, aside from an increase in the use of alcohol. We should point out that this research was carried out in European countries, with unemployment insurance policies that avoided the fear of not being able to support one's family, which is not the most frequent situation in Latin America.

The health problems of the poor population of the continent are also related to the environmental changes, both because of production and of human settlements.

According to Hardoy and Satterthwaite, (1987), while the rural population of the Third World doubled between 1920 and 1980, the urban population multiplied by 10, going from 100 million to near 1.000 million during the same time.

For these authors, although the Third World has the same environmental problems as the rest of the planet, "these problems are generally less serious than the poverty and the little priority assigned to the struggle against its causes and terrible consequences..."

They say that the living environment of the lower income groups of Third World cities is one of the most degraded and unhealthy of all, and they identify some characteristics such as the lack of piped drinking water, sewage and garbage collection, as well as basic means to prevent disease and provide primary care, to which crowding is added.

The site of many poor neighborhoods in our cities is not apt for them, which causes the loss of lives in floods and landslides, simply because those are the only available cheap or free places. On the other hand, because of their location in places that do not adjust to city regulations, quite often governments don't pay attention to them, merely tolerating their presence, without assuming responsibility for them.

The before mentioned authors point out too that "the cities and urban areas of the Third World where there is a great concentration of industries (specially heavy industry) as well as motor vehicles, and where traffic is excessive for the existing streets, have contamination problems that are comparable to those of Europe, Japan and North America", stressing the existing scarcity of documentation to indicate where these problems are most important, or to identify their impact on health.

The housing environment of the urban poor whose job is waste collection (mainly home waste) for later recycling is particularly bad,

since the classification of waste is generally done at home or in a nearby site, resulting in contamination and the presence of different vectors.

## HEALTH SERVICES FOR THE POOR

Dr. Guerra de Macedo, former director of the Pan American Health Organization, has repeatedly pointed out that there is a deficit of health services for the poor population, estimating the number of people who presently have no regular access to care in 140 million. If we add to that figure the 90 million people that will be added to the population during this decade, by the year 2000 it would be necessary to provide services for 230 million people more than those presently covered. These estimations assume that almost no poor in the region has access to medical care today, which is not equally true for all countries.

Carmelo Mesa-Lago (1992) made a valuable contribution to the reflection on health care to the poor in his book "Health care for the poor in Latin America and the Caribbean". The basic assumption of the author, yet, is that of the desirability of social security coverage for health care, which makes him neglect relatively the other modalities of coverage that exist in the Region, particularly the Ministries of Health and NGOs, which are very important in some countries. In fact, as the author himself points out, "a study of 10 Latin American countries carried out in 1970 showed that in seven of them the social security covered less than 12% of agricultural workers, which meant over a third of the economically active population". In turn, he states that those countries in Latin America and the Caribbean with the highest degree of social security coverage are also the ones with the lowest proportion of poor in their populations (for instance, Argentina, Costa Rica, Cuba, Chile and Uruguay - Brazil being an exception).

A table from that publication is presented here, showing the legal health care coverage in the sub- continent.

The case studies presented by Mesa-Lago pose some difficulties because of the choice of groups of people considered poor by the author, which in the Uruguayan case, for example, include industrial workers, a group that is not considered poor in the country.

The ministries of health and social security are the ones usually providing health services to the poor population, in services most of which are not generally used by other better-off members of society. As a consequence of policies to decrease the size of the State that have been applied in many countries of the region in recent years, non-lucrative social services have not been taken up by the private sector, and the State has diminished resources assigned to their direct delivery; such is the case of health services. An assessment of the real impact of this process on the Latin American health services is still pending.

**Legal coverage of health care benefits by the national health systems and/or social security in Latin America and the Caribbean, 1987-1988**

Countries	Initial Law	Salary earners			Groups of poor		
		All the residents	All of them b	Port of them c	Autonomous Workers	Domestic workers	Rural workers
Soc. security							
Argentina	1934M,1944E		X		Xf	X	X
Bolivia	1949			X	Xf		
Brasil	1923E, 1931E			X	Xf	Xi	X
Colombia	1938M, 1946E			X	Xf	Xf	X
Costa Rica	1941		X		Xf	X	X
Chile	1924		X		Xf	X	X
Ecuador	1935			X		X	
El Salvador	1949			X	X		
Guatemala	1946E,1953M			X e			
Haiti	1967						
Honduras	1952			Xe	Xf		
Mexico	1943			X	Xf	Xf	X
Panama	1941		X		Xf	X	X
Paraguay	1943		X		Xf	X	
Rep. Dom.	1947			X		j	
Peru	1936		X			X	
Uruguay	1958M,1960E		X			X	X
Venezuela	1940		Xe			X	
S.Nacional de Salud							
Antigua y Bermuda	1973	X	X		X		X
Bahamas	1972	X	X			X	X
Barbados	1966	X	X			X	X
Belice	1979	X	X				X
Bermuda	1970	X					
Cuba	1934M,1963E	X	X				X
Dominica	1975	X	X				X
Grenada	1983	X	X				X
Guyana	1969	X	X			X	X
Jamaica	1979M	X			X	Xg	
Nicaragua	1955	X	X		Xf		X
San Kitts y Nevis	1971	X	X				X
Santa Lucia	1978	X	X				X
San Vicente	1978	X	X				X
Suriname	1971	X					
Trinidad y Tobago	1971	X	X			X	X

Sources: Based on the Social Security Administration of the USA, 1987 as well as on additional information collected by the author.

M- motherhood E- disease

a-There is a national system of health in the non-Latin Caribbean, Cuba y Nicaragua,(except for Bermuda where there is a compulsory private system of hospitalization) and all residents' care,as this table shows, refers to the benefits in kind. In addition, these countries count with a social security system which grants

benefits in cash (these are shown in the table for the salary earners, autonomous workers as well as domestic and rural ones). In the rest of the countries, health care refers to social security for cash benefits as well as benefits in kind.

b- Practically all the countries exclude the non-remunerated family workers and eight countries also exclude temporary workers.

c- Includes permanent workers of the industrial, commercial, mining, transport, communications sectors, as well as those who work for the Public Administration and Public Services. It excludes the agricultural sector and domestic services as well as temporary workers, domestic, and non remunerated family workers.

d- It refers to the salary work and, in some countries, it includes cooperatives; in Uruguay it also includes the minor producers; regarding the autonomous agricultural workers, see the autonomous workers' column. In Brazil, agricultural workers are protected by a special programme; in Colombia, there is coverage in only a few regions; in Mexico, coverage is being gradually widened to cover salary earners cooperatives, and small communal farms; in Panama, it excludes the workers under six months; in Cuba private agricultural workers are excluded.

e- Coverage only includes the capital city and large urban areas.

f- Volunteer coverage; in Panama, coverage is compulsory for trade union members; in Brazil, Chile and Nicaragua, autonomous agricultural workers are not covered.

g- Only in case of motherhood.

h- Salary earners who turn into autonomous workers have a volunteer prolongation of the coverage.

i- Only in case of benefits in kind.

j- Only for those who work in shops/stores, it does not in those who work at home.

## EXPERIENCES IN THE PARTICIPATION OF THE POOR IN THE SOLUTION OF THEIR OWN PROBLEMS: NGOs

The representation of the poor at the political and social level is generally very limited, or null, although they conform a large percentage of the population, as we have seen. The middle and upper classes have mechanisms of representation and for the defense of their interests, which finally make them be the beneficiaries of governmental actions, even though that may not have been planned so.

Different studies have shown the little redistributive impact of many public policies implemented in the region, that were apparently oriented to increasing the equality of access to services by the population. Public subsidies to higher education are perhaps one of the best known examples. There is still ample room for focal policies whose sole beneficiaries are the poorer segments of population.

The experience of NGOs, particularly with regards to popular participation, the struggle against poverty and the delivery of health care has been very important, but unfortunately, the documentation available at the international level is scarce. In the book "New urban policies: NGOs and municipal governments in the Latin American democratization", the authors present a series of examples of the performance of NGOs in

this field. Amélia Cohn, from Brazil, tells the experience of the Sao Mateus Community Organization, and the Jardim Nordeste neighborhood. Salinas and Solimano present Chilean case studies: The Christ Home, the Corporation of Respiratory Failure Patients, the Pirque program, the Popular Health Research and Action Centre, etc., not all of them geared to the poor population.

The degree of popular participation achieved is quite remarkable, particularly the role of women, who apparently are the ones who carry on most activities.

Despite the enthusiasm that this type of actions may arouse, it is important to point out that the fact that the poor population must carry out by itself tasks that are covered for the rest of the population by public or social services, is another form of discrimination. Hardoy and Satterthwaite (op.cit) state that "Self help has been used by some governments as an excuse to do nothing or very little. But many poor people can't even build their own homes. Their survival often requests that more than one member of the family work long hours". The same comments are valid for health services.

The tension between the need to gain possession of their own destiny by one sector of society, with the degree of participation needed for that, and every individual's right to expect a fair treatment from the State, in our case, in the delivery of health services, does not seem to be solved yet.

## POSSIBLE SCENARIOS

Many scenarios are possible concerning the situation of poverty in the continent and the health of the population in relation to it.

On the one hand, everything may go on as it is now, so that the PAHO estimate of a vegetative growth of the poor and the consequent need to have more of the same services to provide adequate care would be true. In those countries where the demographic and epidemiologic transition is reaching its completion, such as Uruguay, for instance, this will mean the permanence of services dedicated to the care of poverty-related diseases, such as communicable diseases, and those related to nutritional deficiencies, while the services to respond to the chronic pathology of a more elderly population would grow in parallel. It is difficult to imagine that there would be enough resources to do both things, so that the cost of care would rise, or certain pathologies or population groups would be left without coverage.

To a different degree, this phenomenon will take place in all countries, since we have seen the great disparity in the living conditions of social groups in the continent.

Another possibility is that social policy reforms are applied in the countries, so that, continuing with the same economic model, (and as a way to make it viable), social expenditure increases, which will not do

away with the causes of poverty, but its effects would be alleviated. This scenario would be in agreement with the proposal of agencies like the IDB and UNDP, that consider the present situation of the continent as potentially unstable and conflict-generating. In that line, the before-mentioned IDB paper says that "...it is the very viability of the economic reform and the new growth model that are at risk."

The social reform proposed in that paper "aims precisely to reach the proposal of an wholistic strategy, mandatory for the viability of a market economy."

According to the same text, there is a close correlation between the public social expenditure and the indicators of social progress and human development; and the former may mean almost half the income of the poor families of the region.

It is said that the predatory forms of economic exploitation are becoming less viable everyday, so that they rule out the first scenario, but despite their statements, that is yet to be demonstrated. In fact, the authors present two options, and not just one unavoidable road when they say that "For Latin America these realities show the need to choose between this style of modernization that fosters societal integration, or the more traditional forms of growth, that excludes vast sectors of the population..."

The justification of the supposed assumption of the second scenario is that "With the supply of natural and human resources in the region, the mastery of the instruments of economic and development policies, and the possibilities of science, technology and information, this situation of economic exclusion and poverty has no justification." which means that it is not the most profitable development model for those holding economic and political power and for those who have so far perpetuated the prevailing situation of inequity. This statement will probably require economic proof.

Leaving aside the contradiction existing between saying that inequity is not necessary for the model and to propose an increase of public spending to ensure its viability by decreasing its effects, this scenario would include a growth of health services, specially in the neediest areas, with emphasis in mother and child issues (we have already seen the age and sex distribution of the poor populations) and communicable diseases, probably with a primary health care approach.

Within the increase of social spending, we could assume that there would be an incentive to research, at least related to teaching centres.

The third scenario would be somewhat similar, but more realistic in that it would concentrate existing expenses in the neediest groups, without increasing total social expenses. This would probably have the highest impact in the reduction of poverty.

A fourth scenario, considering not a reform of State policies with growth of public spending, but a revolution (in its meaning of a fast,

complete change) in the ownership of the means of production and generation of wealth, seems highly unlikely.

There are of course, multiple possible combinations, both because of the coexistence in time of countries whose situation is better represented by one or other of the before-mentioned scenarios, and of situations corresponding to the different scenarios within the same country.

The situation of poverty generation may remain unchanged, but the number of the poor not to increase as predicted in the first model, be it because of massive birth control practices in this population group, or because it is decimated by war or disease, as some African countries have dramatically shown in recent years.

In our opinion, the most likely scenario is the first one, despite UNICEF Director General, Lewis Grant's hopeful words "...for the first time, we have the possibility of overcoming the worst aspect of global poverty in a lapse of 8 to 10 years. I'm not saying that we shall do it, but that for the first time there is the potential and it is so near that we can almost touch it."

## RESEARCH CHALLENGES

Subjects related to poverty are quite varied, so that research areas are also many. As we shall see in the following list, it is a multidisciplinary matter, since techniques from economics, anthropology, sociology, epidemiology, psychology and political sciences are needed to respond to the numerous questions on the subject.

The causes of poverty have not been sufficiently studied, and what's missing are development models that are truly alternative and viable, and do not mean a temporary or permanent impoverishment of population groups.

There is ample room to deepen the knowledge on ways to measure poverty, looking for indicators that are suitable to different societies, but that also allow for some sort of comparison among groups and along time.

There is a need to deepen the knowledge on the culture of poor populations, since most existing works seem to consider "the poor" as a homogeneous category, no matter what society they belong to, which does not seem realistic, neither because of their history nor for the possible survival strategies available to them.

The issue of the social and political representation of the poor populations requires a much greater understanding. The presence of these groups in many of our societies is lived as a threat or a concern because of their number, but does not find a voice in the formal representation systems, or this is taken up by third parties, such as the churches, for instance. It would be important to get to know experiences

of popular organization that have ended up in a true improvement of the situation of its participants, and had some degree of temporal continuity.

We need to know what is the health situation of the poor in each country, and the available statistics do not suit this need because of the lack of consideration given to the variable social class, which differs from the common practice of countries such as the United Kingdom, where this information is available. More than case studies, what is needed is the inclusion of this variable in the statistics of the countries of the region.

The lack of morbidity studies also hinders the knowledge of the health situation, specially of the population we are concerned with, that often bears through a lifetime the burden of different chronic diseases, communicable or not.

Applied research is needed on systems to supply safe drinking water and sewage that are of low cost and effective under different climatic and environmental conditions.

Information is also required on the existing levels of contamination in cities, and particularly in their marginal areas, both in air contamination with nitrogen and sulphur, and water contamination with sewage and industrial effluents.

There is yet much room for research on health care financing, particularly for the poorer sectors of society. There are no comparative studies on the effects of the different forms of payment on the access to services, nor on the health of the user populations, and information is likewise missing on what has been the effect on health services and population health of the different models of State reform applied in the region.

In a more restricted issue, there is also a need to know what intrasectoral resource reallocation mechanisms have been used successfully in the region (if any) in order to redistribute resources equitably, since all of them have their opponents.

The service delivery model is an area of study in itself. In the past decade, primary health care was the prevailing discourse, but since the World Health Organization has apparently given up its aim of Health for All by the year 2000, it is not clear whether the strategy originally adopted is also in doubt. Without getting into that discussion, it is valid to wonder what is the most appropriate basket of care, both epidemiologic and economically speaking, for each region, and what are the mechanisms for those cases needing care other than that included in the basket.

The delivery of care in multi-ethnic societies, to migrant population or in particularly violent areas, poses specific challenges, that are yet far from being solved.

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# RELATIONSHIP BETWEEN POVERTY AND HEALTH

*Jaime Sepúlveda Amor*

## POVERTY

In many academic and political circles, the idea is held that poverty is such an obvious and visible phenomenon that it is unnecessary to dedicate efforts to study and learn about it. However, there is no consensus as to the concept of poverty itself and its transfer to measurable elements. The fact is that without an accepted concept and without adequate measuring instruments, the efforts to diminish or eliminate poverty are fruitless. As Boltvinik points out, "knowing the volume and characteristics of the poor population is the same as defining the target population for certain policies. Without this knowledge...there is a risk of finally benefitting different population groups. Nor is it efficient to initiate actions without knowing what the specific deficiencies of the different poor groups are, whereby the methods that are very valuable are those ... that enable to subclassify the poor according to the nature of their deficiencies..." (Boltvink, 1992).

Contemporary attempts to define and measure poverty date back to the end of the XIXth Century, among which the classical studies of Rowntree on poverty in York stand out. Other very respectable studies done in the present century are Townsend's study on the situation of the poor in the United Kingdom at the beginning of the second half of the XXth Century, and that of Mollie Orshansky on poverty in the United States during the sixties. (Haralmabos 1981, Towsend, 1979 and Orshansky, 1963).

From the conceptual point of view, A. Sen's reflexions have helped clarify multiple aspects related to the determinants of poverty.

More recently, multiple studies and important contributions to the methodology have been made in Latin America, complementing the large literature existing around the definition and measurement of poverty. The pioneer study was done by the Economic Commision of the United Nations for Latin America and the Caribbean (CEPALC) using data from

1970 and uniform criteria for 11 countries (Piñeira, 1978) and updated by Altimir (Altimir, 1987). Specially worth noting are, among others, the studies published by Boltvinik (Boltvinik, 1984 and 1990) and Hernández Laos, (Laos, 1989 and 1992) on poverty in Mexico; the study on poverty in Uruguay by Katzman (Katzman, 1989), Minujin and Vinocur's publication on the poor in Buenos Aires (Minujin and Vinocur, 1991) and other studies that have focused on the analysis of poverty by measuring the unfulfilled basic needs.

## NOTES ON CONCEPTS AND WAYS OF MEASURING POVERTY

The classical definition of poverty derives from the guidelines developed by Seebohm Rowntree in 1899 in his famous study on poverty, carried out at the beginning of the century in York. The families with "primary poverty" were defined by him as "... those whose total income is insufficient to cover the basic needs related to the maintenance of the simple physical efficiency...". (Rowntree, 1899). This biological approach is very controversial because on one hand it has supported the development of the indirect measurement of poverty based on the establishment of poverty lines, and on the other hand, it has been very much criticised. On this aspect, Sen mentions the fact that this approach presents serious problems because there are significant variations according to the physical traits of people, climatic conditions and working habits. Secondly, in order to convert minimum nutritional requirements into minimum food requirements it is necessary to select the specific goods, because, in general, diet is extremely monotonous and cheap and does not reflect the eating habits of people. Finally, it is very difficult to define the minimum requirements for non-food items. This is the typical example of an absolute definition of poverty.

Another approach by which poverty has been identified is comparing it to inequality. Miller and Roby point out: "In this approach, we depart from the efforts of measuring poverty lines with pseudo-scientific precision. Instead, we consider the nature and size of the differences between the lowest 20 to 10 percent of the social scale and the rest of the scale." (Miller, 1971) However, arguments against it are that although inequality and poverty are related to each other, none of the two subsumes the other. "An income transfer from a person in a higher income group to one in a medium income range has to reduce inequality *ceteris paribus*, but the perception of poverty may remain practically unchanged."

In fact, the World Bank is very clear in its 1990 report where it states that "...poverty is not the same as inequality, ... poverty is referred to the absolute standard of living of a part of society... whereas inequality is referred to the relative standards of living in a general society..." (World Bank, 1990).

The use of an official definition of poverty is also identified in the literature. In using it, the governments that put it into practice, on the

basis of the official poverty lines, establish which proportion of the population will be the target of welfare programs. The Social Security Administration in the United States, official agency in charge of publishing every year the statistics on the poor in that country, bases itself on a concept of economic poverty or what others call material poverty. To them poverty is a circumstance defined by a specific number of conditions that reflect economic deprivation without considering other possible privation. \* A poor family in the United States is one that "...does not have enough economic resources to consume goods and services that enable it to achieve an adequate standard of living, appropriately defined for the United States ...". In spite of maintaining a minimum of basic needs (food, clothing, housing) that should be fulfilled when estimating the poverty line, inflation has modified the section point in the past 35 years. In 1963 a family of two adults and two children achieved this consumer level with 3,100 dollars; by 1992, to obtain the same products for a similar family group 14,228 dollars are required a year.

Another term which is frequently used to make an approximation to the study of poverty is that of "relative deprivation". This term includes the notions of "feelings of deprivation" and "conditions of deprivation" are included. Peter Townsend maintains that the second meaning is more acceptable and argues that it is possible "to define the style of living generally shared or approved in each society and assess whether ... there is a point in the scale of resources distribution below which families find growing difficulties ... to share the customs, activities and festivities that are part of that style of living" (Townsend, 1974). However, Sen points out that in order to define style and standard of living, whose impossibility to share is considered important, the feelings of deprivation should also be taken into consideration, discussing which reference groups are selected for comparative aims. "The framework of comparison," maintains Sen, "is not independent ... of the political activity in the studied community, because the feeling of deprivation of a person is intimately linked to his/her expectations, to the perception of what is just and to the notion of who has the right to enjoy what." Furthermore, there are situations -famine, for example- where the relative pattern within a society has no transcendence. For this reason it may be concluded that "there exists an irreducible core of absolute deprivation in our idea of poverty that is expressed in the reports on famine, malnutrition and suffering that are visible in a diagnosis on poverty without the need of knowing the relative situation beforehand. Therefore, the approach of relative deprivation complements, but does not substitute the analysis of poverty in terms of absolute dispossession" (Sen, 1992).

From Rowntree's studies to date there has been an interest in identifying primary and secondary poverty. Several methods have been

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\*. Privation can be observed in different areas: access to Health Services, transport, etc.

developed to this effect that enable an approximation to each of them. One of these is the "direct method" consisting in identifying a group of persons whose present consumer basket fails to satisfy some basic need (UBN); another is the "income method" or indirect method, which consists in estimating the minimum income per family so as to establish a poverty line below which families are unable to satisfy their basic needs (PL).

In general, both have a partial view of poverty and therefore tend to underestimate it, but rather than considering these as alternative methods, they should be seen as complementary. In fact, this reasoning gives way to a tendency in the nineties that proposes an integrative measurement of poverty, that is to say, "...an integrative measurement of poverty implies revising the different steps of the UBN and PL methods, eliminating redundancies and searching for complementary aspects; ... by no means should the acritical joint application of both methods be recommended..." (Boltvink, 1992).

## HEALTH

Throughout history the concept of health has undergone multiple transformations. At a given time it was identified as the absence of disease, as a strictly biological phenomenon; in the last decades there has been a concern to broaden the content of this term and include elements of wellbeing. Thus, towards the end of World War Two, the World Health Organisation defined health as "a state of complete physical, mental and social wellbeing, and not only as the absence of disease" (World Health Organization, 1971).

From this definition we can consider health as a field of encounter of economic, political and social phenomena, and that the actions oriented at guaranteeing the best possible level of health involve not only the health sector but also those sectors in charge of guaranteeing adequate levels of nutrition, education, housing and social welfare. In this sense health may be considered as the variable that depends on this group of factors, and public and individual health services as the factors that mediate between the socio-political-economic determinants and the health of the population.

However it is worth mentioning that when measuring the health-disease process in populations, indicators solely documenting the biological process are generally used, so health is measured indirectly, that is to say, that measurements of the damage to health are made through the assessment of morbidity or mortality.

## POVERTY-DISEASE-POVERTY CYCLE

Although the relationship between poverty and deterioration of health - where nutrition plays a crucial role - may be clear to the majority, it is also important to recognize that, in the opposite sense, deficits in health aggravate and help perpetuate poverty.

Poverty is commonly identified as an important condition that has a direct correlation with the risk of becoming sick and dying from well identified causes. The mechanisms which initiate the poverty disease cycle are expressed as from the moments of gestation where malnutrition of the poor mother, the characteristics of her reproductive pattern (age, parity, duration of the intergenetic period) and the inadequate antenatal and delivery care she receives, are associated with high infant mortality or with the high risk of breeding children with low birth weight and other perinatal disorders.

During childhood, the deficient fulfillment of nutritional requirements leaves irreversible marks on the poor population. For example, development and growth problems are reflected in low stature of the majority of the poor population or the higher risk of catching infectious diseases is exacerbated by the unhealthy conditions of the environment where they live.

The same occurs in adult age with respect to work: the low energy levels caused by an insufficient and inadequate diet and the frequent diseases that they contract produce a low working performance, a situation that is specially unfavourable for those workers who have jobs with high physical demands.

The disease poverty cycle continues when the loss of health may lead a subject and his family to extreme poverty conditions. This fact is exacerbated when the heads of family stop generating income as a consequence of their health problem, poor families have to face costly treatments that make them pay excessive costs to recover their health, the interruption of prolonged treatments or rehabilitation and other events usually referred to as catastrophic health costs.

According to Sen, the loss of health affects one of the most important natural endowments, which is the labour force. The loss of working capacity (deterioration of labour force) caused by diseases or accidental or intentional lesions force individuals to make use of the public (a right conferred by the State) or private (a right resulting from the market relationships to which that person is subject through the product of his work) health services to recover their previous health status and be reincorporated to the labour market. However, when the individual does not count on rights derived from his relationship with the market, he has not got access to the social facilities conferred by the State, his impoverishment becomes imminent.

## **Risks for health related to poverty**

The following information answers some fundamental questions on the health risks of the poor in Mexico. This information was obtained from a study made at the National Institute of Public Health on "Inequality, Poverty and Health in Mexico" carried out in 1992.

### *I. How do the poor reproduce in Mexico?*

The most relevant aspects of the reproduction of the poor are listed below.

1. Women in extreme poverty present a global fertility rate (GFR) for the period 1984-1986 of 5 children in average; whereas women that are not poor present a GFR of 3.2 children.

2. Poor women and those living in extreme poverty have, in average, more children than non-poor women. This difference becomes more evident after the age of 25. At that age there is an average difference of 1 child in poor women compared to non-poor women, and on completion of the reproductive cycle (45 to 49 years of age), the difference between these two groups is an average of 4 children. That is to say, women in extreme poverty have 3 children at the age of 25, and non-poor women have an average of 2 children; at the age of 45 the former have an average of 8 children and non-poor women, <sup>4</sup>.

Some of the reasons that contribute to the differences in fertility are:

a) women in extreme poverty begin their reproductive life at a younger age than non-poor women. The first union of women in extreme poverty occurs between the age of 15 and 17, whereas in non-poor women this occurs after the age of 19.

b) women in extreme poverty have their first child at a younger age than non-poor women. There is a 2.5 higher probability for women in extreme poverty to have their first child before the age of 17, compared to non-poor women.

c) the characteristic reproductive patterns of poor women are:

- Adolescent mothers with more than one birth, and less than two years between births.

- Mothers between the ages of 20 and 34 with four to six children, well or poorly distributed.

Both patterns contribute, in average, to 23% of the births.

d) the characteristic reproduction patterns of women in extreme poverty are:

- mothers aged 20 to 34 with more than six children, well or poorly distributed.

- births of women aged 35 and more.

Both patterns contribute, in average, to 35% of the births.

e) Compared to non-poor women, a smaller proportion of women in

extreme poverty are aware of every method of fertility regulation, existing among them a greater heterogeneity in the knowledge of the diverse methods.

f) Women in extreme poverty have a greater probability (1.7) of never having used a contraceptive method, compared to non-poor women.

3. At present, women who use contraceptive methods do so in different ways depending on their economic situation. Poor women for example preferentially use definite methods or monthly injections, and when they live in rural areas they use oral contraceptives. Non-poor women, on the other hand prefer the use of intrauterine devices or pills and the definite methods in a smaller proportion.

## *II. Under what conditions are the poor born in Mexico?*

A determining factor of greater importance for the survival and quality of living of the individuals is their state of health the moment of birth. A very sensitive indicator of the health status at the moment of birth is birth weight. Two aspects are added to the analysis of the distribution of this indicator, that occur earlier in time and that simultaneously condition their presentation: Antenatal care and delivery care. Relevant aspects in this sense are:

1. One out of four pregnant women in extreme poverty does not receive antenatal care. On the other hand, one out of eight poor women and one out of twenty non-poor women that are pregnant does not receive antenatal care. From those who do receive perinatal care, more than half the extremely poor women postpone care to the second trimester of pregnancy, whereas 75% of non-poor women receive care as from the first three months of pregnancy. Antenatal care is provided by the physician to 90% of non-poor pregnant women and 55% of extremely poor women.

2. One out of two women in extreme poverty delivers her baby at home compared to non-poor women where the proportion is one out of ten. Social security and private services concentrate deliveries of non-poor women (seven out of ten); however, only three every ten are of poor women. From every ten women in extreme poverty who give birth to a child, half are assisted by a physician or a nurse, four by a midwife and one is assisted by a relative or on her own. The risk of a woman receiving delivery care from a family member or of being on her own during delivery is seven times greater in women in extreme poverty than in non-poor women.

3. Given the high level of non-institutional delivery care in general, and specifically in the poor population, an important proportion of children (35%) do not have their weight recorded at the moment of birth. Seven out of ten children whose weight was not recorded at birth were extremely poor children, from the remaining three, two were poor and one was not poor.

As to the children who did have their weight recorded at birth, 15%

of the children in extreme poverty had low birth weight, contrasted to 7% of non-poor children.

Unfortunately the lack of birthweight records does not lead to reliable comparisons at the international level; however, it can only be stated that the non-poor subpopulation lies within acceptable figures of international standards.

### **What do poor women in childbearing age die from?**

In 1990, the mortality rate at national level was 125.5/100,000. 30% of the deaths occur in communities of less than 2500 inhabitants. It is worth noting that these deaths are subject to an important sub-recording, and the figure is probably higher in isolated, poor and marginal zones.

Compared to the low-marginality women, those with medium marginality have a 10% higher risk of death, those with high marginality, a 24% higher risk, and the ones of very high marginality, a 90% higher risk.

Compared to the rest of the population where the first cause of death in women are malignant tumors, in municipalities with very high marginality maternal deaths, that is to say those occurring during pregnancy or during 40 days after delivery, occupy the first place in importance (20.3/100,000 women), followed by intestinal infections (18.9/100,000 women).

At least 30% of the deaths of women in childbearing age in municipalities with very high marginality are avoidable, if the objective is to achieve, at least, the standards of the rest of the population. From the deaths due to diarrhea and intestinal infections, 90% are avoidable, and from the maternal deaths, 70% are avoidable.

### **Maternal deaths**

Once more emphasis should be made on the serious problems of sub-recording. The figures could not be quantified, except in the Federal District, where for each recorded death, there is another death that is not identified as maternal death. It is logical to assume that in those places where it is most imperative to know in detail the number of deaths, it is where the least information is available in that respect: in 1990, 65% of maternal deaths occurred in rural areas (46% in communities of < 2500 inhabitants); more than 60% of non-insured women; a third in women who received no medical care before their death. It is worth noting that the women who died from a maternal cause and who were non-insured had a 7 fold greater risk of not receiving care than those who are insured. Notwithstanding the bias caused by the lack of information, the results are overwhelming: the risk of dying from a maternal cause, in terms of

deaths per 10,000 births, is 3 times higher in the municipalities with very high marginality than in those with low marginality. The majority of maternal deaths are directly attributed to five causes: hemorrhage, infection due to lack of hygiene during delivery, abortion, eclampsia, and prolonged or obstructed labour. The nutritional state of the woman can increase the risks associated to pregnancy and delivery.

### **What do poor women say they get sick from?**

The study of the data from the National Health Survey, which attempted to describe the groups among the extreme poor who presented the greatest morbidity excesses for certain diseases, shows the following results: a) the extremely poor have a higher prevalence of malnutrition than the rest of the population. 50% of the prevalence excess occurs in women aged 25-44; b) although accidents caused by crashes or running over were not more frequent than in the extreme poor, there are some subgroups where these were reported to have a higher frequency than in the rest of the population. Women aged 25-44 accumulate 20% of the excess; c) all disabilities appear in excess among the extreme poor. Women aged 25-44 have 26% of the excess of disability of congenital origin, 13% of recent partial disability and 8% of permanent partial disability.

### **What is the risk of dying for poor children under one year of age in Mexico?**

Vital statistics show that in Mexico, infant mortality has had a marked decrease in the past 40 years, dropping to 23.8% in 1990. However, this decrease has not been even from one state to another nor from one marginality region of the country to another. The results show that geographical inequality of infant mortality has increased. Epidemiological polarization is seen both in neonatal mortality and in post-neonatal and pre-school mortality, although to a greater degree in the latter.

The analysis of the National Survey on Fertility and Health shows an infant mortality rate, for children born alive between 1982 and 1986 of 41.1 per 1000 live births. Children belonging to the lowest socio-economic strata consistently show a higher probability of dying in their first year of life, compared to their counterparts of the higher strata. So, for example, children born in extreme poverty conditions have a relative risk of death twice as high as the non-poor; those living in homes in bad condition have 3.7 times more chances of dying during infancy than those living in houses in good conditions; the risk for children born in communities with less than 2500 inhabitants (39.8% of the sample) is five times larger than for their counterparts who are born in large cities.

Their infant mortality rate is 64.4, that is to say 23 percentage points above the national average. The macro-social variable that shows the greater effect on infant mortality is the size of the district where they live. It is likely that this variable reflects the degree of access to public services such as water supply, drainage, electricity and transport, as well as to educational and health services. For nearly all the variables related to health needs, it can be observed that the variation due to the conditions of housing is higher than that observed for poverty. In other words, it is the material living conditions resulting from a given income, that affect infant mortality rate and not the income per se.

The differences in infant mortality found in defined groups according to poverty and housing are mitigated when controlling for branch of activity, supporting the assumption that part of the effect poverty has on infant mortality can be explained by the area of residence and everything this implies.

The mother's education is the variable that, together with district size, shows the highest association to infant mortality. It is, at the same time a social stratification variable and one of the mother's characteristics that, in fact, precedes in time a whole series of other maternal elements that are risk factors of infant mortality, as are the reproductive pattern, the mother's and the child's health, the use of the health services, etc.. It is possible that the mother's schooling might operate through these variables to produce the effect on the children's survival.

Birth weight is among the determinants of infant mortality, 35.5% of Mexican children have not had their weight recorded at birth. The immediate reason for sub-recording is the high prevalence of children born in non-institutional environments. Children whose birth weight has and has not been recorded differ in practically all aspects, specially in the cultural and socio-economic environment to which they belong. From those whose birth weight was not recorded, 70.6% live in conditions of extreme poverty and an additional 17.5% in conditions of poverty. The corresponding figures are 29.9% and 20.2%, respectively, for children whose birth weight was recorded. A similar situation is verified for the remaining indicators of socio-economic standard. Health conditions of children whose birth weight was and was not recorded differ significantly. Children with unrecorded birth weight have a infant mortality (60.3 per thousand live births) twice as high as that of children with recorded birth weight (30.6). This is the result, on one hand, of the lack of medical care at the time of delivery that is characteristic of these cases, and of the fact that, foreseeably, this will continue to be the case at least during infancy. On the other hand, given the socio-economic profile of this group, it is likely that a great proportion of children with low birth weight will be concentrated here, larger than for children who have had some recording of their birth weight.

Low birth weight (< 2.5 kg) has been pointed out as the most important

determinant of neonatal mortality. Children with low birth weight who survive the neonatal period are more affected by malnutrition and infections than those with an adequate weight; they have, therefore, a higher probability of death during infancy. Among the infants with recorded birth weight, the prevalence of low birth weight at national level is 10.2% and shows an inverse relationship to the socio-economic level. So, for example, the relative risk of being born with low birth weight for children in extreme poverty is 2.1, compared to non-poor children.

### **What are the causes of disease and death in poor pre-school children?**

Data of the National Health Survey show that diarrhoea is more frequent among the extremely poor than in the rest of the population, and that nearly half of the prevalence excess is concentrated in children under 5 years of age (46%). Respiratory infection was not the most frequent cause in the extremely poor, but among these there are subgroups where the disease is more frequent than in the rest of the population: nearly 60% of the morbidity excess is accumulated in pre-school children.

Data of the National Survey on Fertility and Health show that the prevalence of diarrhoea in pre-school children (less than 5 years of age) decreases as the socio-economic conditions improve. The differences are greater in the case of housing characteristics than for the poverty variable and become even greater according to branch of activity. The most adverse environment of agricultural populations, and the fact that this is directly linked to the prevalence of diarrhoea, account for the variations that were found.

As to the size of the district of residence, the prevalence of diarrhoea decreases, as was expected, as the area becomes more urban. However, in metropolitan areas, this increases again.

According to the vital statistics, deaths at pre-school age are 5% of the total deaths in Mexican population, and the proportion increases as marginality increases. Pre-school mortality descended 90% in the past 40 years, from 26% to 2.4%, but not evenly throughout the states and marginality levels.

The main causes of death for this age group are intestinal and respiratory infections, except in the cases of municipalities with low marginality, where deaths from accidental lesions take the first place. For all causes there is a direct association between marginality and death, except for congenital disorders, accidental lesions and malignant tumours. Differences are greater for deaths from diseases that could be avoided with basic sewage, such as pneumonias, immuno-preventable diseases (e.g mortality caused by measles is three times higher in municipalities with very high marginality than at national level) and from malnutrition.

The proportion of preventable deaths in the municipalities with very high marginality is 38%, compared to the rest of the country. In these municipalities more than 50% of the deaths from infectious or deficiency diseases are avoidable.

To sum up, the problems in this population, the poorest women and children in the country are reduced to three categories: those related to the reproduction process, to deficiency diseases and to infectious diseases, and can be solved or mitigated with a relatively reduced number of measures, independently of the structural changes that without any doubt are essential. These are: increasing accessibility and optimization of the care provided in the existing mother-child health services, promotion of breast-feeding, regulation of birth control, prevention and control of the most frequent infectious diseases and nutritional education and surveillance.

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# RESEARCH IN PUBLIC HEALTH AND HEALTH SYSTEMS IN LATIN AMERICA IN THE LIGHT OF THE REFORMS

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## PROBLEMS OF SERVICES AND CHALLENGES

The present and middle term needs for research in the area of Public Health and Health Systems and Services are conditioned by a series of changes that are taking place in the health system *environment* and *within* the health systems themselves. A great part of the processes that are starting today are expected to continue during the coming 15 years.

### **Changes in the health system environment**

Research on health systems and services in Latin America must be examined in the light of the great macrorends that are observed in their mediate and immediate surroundings and that are conditioning, and will continue to condition, a series of changes that will require modifications in the training of human resources and will generate research needs, not only in relation to the changing health - disease problems, but also in relation to the organization of health services themselves and of the strategies to make them reach the population needing them.

*The demographic transition* (Sepúlveda and Gómez Dantes, 1995) that is taking place with the aging of the population and the decrease in the percentage of children in total population implies changes in the profile of disease and in the demand for health services. The growing urbanization processes, at the same time, generate new needs and problems that must be solved by the health systems.

The *epidemiological transition*, conditioned partly by the previous situation, is characterized in Latin America by a delayed and polarized transition, (Sepúlveda and Gómez, 1995) with the coexistence of communicable diseases, the growing role of chronic disease, the reappearance of problems that had disappeared (cholera), or that had been controlled (malaria, TBC, dengue), the appearance of new problems

*(AIDS) and the growing problem of trauma caused by violence or accidents.*

The technological changes in health related sciences (genetics, molecular biology, immunology) as well as in other areas (telematics, cybernetics, imaging) generate new services and new research requirements.

The environmental changes, with pollution of air, earth and water, deforestation and the depletion of water sources and the processes of desertification, the destruction of the ozone layer, have consequences on the health systems and generate research needs: (Belmar, 1995)

There is a growing acceptance of the new health-disease paradigm (Lalonde, 1974) at the level of policy formulation and program development, with a greater stress on the promotion of health, the prevention of disease and the multisectorial health policy (WHO, 1988) formulation. This new paradigm, based on recognizing the multicausality of the health-disease phenomenon, which gives a relative importance to the hegemonic role of health care professionals and the medicalized and hospital-based approach of health sector, leads to the explicit recognition of the importance of establishing health objectives for the different sectors and therefore widens, the scope of health policies and the research thereof.

### **Changes within the health system**

Never before in the contemporary history of health systems had there been an era of such multiple and generalized changes. The contemporary predecessor of the modern universal coverage systems probably dates back to the German Duchy of Nassau in 1818, that developed a complete system of medical state services (Sigerist, 1990). Bismarck's proposal of health insurance, workmen's compensation, old age and life insurances dates back to 1883; and it was necessary to wait until the Bolshevik revolution for the establishment of national universal coverage systems in this century, whose implementation has been slow and progressive. The British system dates from 1948, and the essence of the present Canadian system dates from the seventies (ODEC, 1992), although their Saskatchewan experience dates back to the end of the 40s.

In our region, up to the post-war years, there was a predominance of systems where State participation was secondary, because the burden fell on religious communities, private voluntary prepaid health systems, municipalities, provincial administrations or private practice. The contribution of research to services was practically nonexistent.

A more active role on behalf of the State appeared, either through the constitution of National Health Services as in Chile (1952), (Marcel and Arenas, 1991) or National Health Systems as in Columbia (1975), (Orejuela, 1978) or through a more or less universal Social Security system such as in Mexico and Costa Rica, or through mixed provider systems, with relative control by the Ministries of Health. In this period,

contributions appear in the form of Public Health studies, surveys on national morbidity, sanitary statistics, carried out mainly by state initiative and by their own organizations.

Since the Chilean experience with the ISAPREs (1981), (Marcel and Arenas, 1991) the Brazilian reform with the creation of the Sistema Unico de Salud - SUS ('Single Health System') (1988) and the creation of a National Health Insurance system in Columbia (1993)\* there begun a series of reforms that might constitute a *third wave* in the guidelines for health systems.

The Columbian and Chilean reforms are characterized by the establishment of financial insurance mechanisms of the population through prepayments and subsidies focused on demand, on the more active participation of the private sector, the managerial approach of medical care, decentralization, open market competitiveness, the incorporation of advanced management and a regulatory role by the State.

The Brazilian reform aims at integrating social security services and those of the Ministry of Health under a single command in a decentralized and mixed scheme, with private sector participation.

In the coming years most systems in our continent will undergo reforms that reflect a change in the economic model, characterized by an opening approach both towards the foreign and the domestic sector, as part of a philosophy of competitiveness; through the access to markets, with a trade globalization process, with a wider private participation. (World Bank, 1993) At present the world is undergoing a process that covers all continents, in which a series of very important changes in health systems are taking place. In our continent, this process has reached practically all countries, with varying degrees of intensity.

In this decade, the reform processes have increased with the *aim* of increasing equity of benefits, management efficiency and effectiveness in the provision of health services. (BID, BIRF, CEPAL, OEA, OPS/OMS, UNFPA, UNICEF, USAID, 1995) Apart from these aims, the reforms are also putting forward *objectives* centered on the quality of services, financial sustainability and user satisfaction (González, Op. Cit.)

The report presented by the Secretariat to the XXXIX meeting of the Executive Committee of PAHO/WHO, identifies the following policies as the most widely used in the health sector reform in the subregion of the Americas (1995) (PHO/WHO, 1996):

- Managerial decentralization
- National Health Insurance
- Cost recovery
- Basic care plans
- New contracting forms

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\* Law N° 10, 1990, laws N° 60 and 100, 1993.

Financial decentralization  
Focalized public expenses  
Hospital autonomy  
Selective privatization  
Drug policies

A study recently drawn up for PAHO (González, 1996) found a total number of 18 reform policies, of which seven are related to financing, four to the organization of the health system and seven to service provision. In the area of *financing*, the policies refer to health insurances, cost recovery, prepaid modalities, coverage extension, cost contention and creation of compensation funds. In the area of *health system organization* the policies are decentralization, restructuring of the Ministries of Health, national health systems and separation of financing and provision of services. In *provision of services*, policies are being put forward, with basic service packages, focalization, payment modalities to providers, public/private complementation, service autonomy, contracting out of services and specific programs.

To the above mentioned aspects, it is necessary to add drug policies, citizen participation with an increasingly active link of the different communal instances in the planning, programming, execution, follow-up and assessment of health services, as well as an officially less recognized aspect, but which is occurring in the reality of health systems, namely the growing influence of alternative practices, already recognized by some of the Ministries of Public Health. Similarly, the recognition of the need to obtain intersectoral articulation to achieve health objectives is starting to gain ground. (PAHO/WHO, 1996)

National systems have a strong influence on the way of organizing the provision of health services, and these determine, at the same time, the individual practice between individual provider and user. *Governments* should guarantee the widest possible coverage to the population, particularly to the groups considered poor in the rural and urban areas, and define at the same time, the level and the distribution of public expenditure on health. The reform implies a decentralization of services, both to the municipalities and to the urban areas, as well as within institutions, and this implies establishing forms of control and support forms that were not necessary in the previous model. The greater competitiveness entails the need to regulate services, controlling costs, effectiveness and quality in the provision of services. When the model maintains an important State participation in the subsidy system or in the direct provision of services, it is important to know what the cost of the medical activities is, in order to estimate fees and insurance values. In order to make the latter decisions, it is necessary to have information on needs, costs, user preferences, prevailing pathologies, efficiency of different provider schemes, etc., all of which are scarcely available in the

Latin American region.

The *directors or owners* of the service networks must be sure, among other things, of the investment requirements and capacity, of the profitability of the different service options, the possibilities of attracting market segments, the cost contention mechanisms, customer preferences, financing strategies, advantages offered by competitors, interinstitutional coordination and integrated information systems. For this kind of decision making, economic and administrative studies are required, which should be carried out in most countries of the region, because they do not differ from those of other industries.

The *directors of institutions* should adapt themselves to a world of competitiveness where the things that count are the capacity to attract market segments, publicity and sales, the service offered to the client and the quality in the provision of medical care that generates user satisfaction and loyalty to the institution. Profitability through expenditure control, increase in productivity of resources and effectiveness and modern contracting and sub-contracting forms are key factors in those institutions willing to compete in open markets. Good decisions made at this level require some specific studies and both powerful and reliable medical and managerial information systems.

*Individual service providers* in turn, should learn to function in systems demanding cost contention, high yields in terms of time and investment, effectiveness in diagnoses and operations and standardized practices that guarantee the best service quality. Furthermore, the individual provider should be aware of the contracting modalities that are best adjusted to their expectations and good decision making capacity in daily practice, which requires an excellent academic training and update in medical science, and in aspects related to the forms of service provision.

### *Contributions of Research*

The role of research in Public Health or in health services and systems has been, to date, quite limited in the region. Research carried out by Pellegrini (Pellegrini, 1995) shows how this has accounted for only 2.7% of the indexed publications in health, compared to clinical sciences which contributed with 53.4%, and biomedical studies with 43.9%.

Research on health systems and services has concentrated on public health, demography and epidemiology; very little literature exists on compared health systems, health economics, use of services, practice styles, quality of care or socioanthropology of health.

It is important to point out that many of the changes that are taking place in the countries of the region (and of the world) are based on assumptions that have not yet had enough empirical validation. "There are practically no data, for example, for the comparative assessment of

the impact on health of the different payment policies to workers in the health sector, of different financing systems, of the impact of reforms such as decentralization and the introduction of co-payments, the impact of tax instruments to promote healthy policies, or of the results of different approaches to establish priorities in the distribution of resources (Committee on Health Research Relating to Future Intervention Options, 1966).

There is consensus (Committee on Health Research Relating to Future Intervention Options, 1966) on identifying the importance of research in the field of health systems reforms and in decentralization. In fact, the different reforms that are being implemented become more or less extensive natural experiments that should be subject to research, in order to compare, on the basis of scientific verification, to what extent the basic assumptions on which they are based, actually occur.

The special meeting on the health sector reform (IDB, BIRF, CEPAL, OAS, PHO/WHO, UNFPA, UNICEF, USAID, 1995) proposes the usefulness of considering three phases of the reform (development, ratification, execution), during which it is important to follow certain crucial aspects, and makes specific emphasis on the following: financial equity and equal accessibility, quality assurance, efficiency, cost contention, financial sustainability, public and private cooperation, biomedical ethics, technological assessment, availability of essential drugs, regulation of the health sector, management of sanitary services, community participation and decentralization.

### *Research needs and Proposals*

PAHO's ad hoc Committee on Health Research (Committee on Health Research Relating to Future Intervention Options, 1996) has identified the following ten priority areas for research in health systems and policies:

- Establishment of priorities for distribution of public resources
- Financing of health services
- Transfer of policies to plans and action
- Assessment of health requirements and monitoring systems
- Decentralization
- Mixed public/private participation in providing services and financing
- Assistance standards and quality
- Commitment with communal organizations
- Establishment of the policy agenda
- Information management

After reviewing the problems, the challenges that they imply and the contribution made to date by health services research in the region, it is clear that it will be necessary in the future to count on the contribution

of research in all its modalities, with the aim of making decisions that will become increasingly complex. It is no longer enough to make exact copies of experiences made by others or improving services by correcting past errors, because time and opportunities are precious and the costs involved can be very high.

The situation of services in the stage preceding the strong State participation did not demand the use of research, because this neither existed, nor did the fragmentary institutions require the participation of methodical research. During the period of a strong state intervention, the first integrated health systems were created and it was necessary to resort to general studies that could orient decisions; however, state protection was so marked that rarely did the services networks or the institutions themselves have difficulties or were endangered. In the present phase of deep-reaching reforms, where not only the service delivery schemes are modified, but also financing and control, great risks are run of going bankrupt or of being inefficient, it has become essential to count on solid information systems with the support of studies and research that facilitate decision making. On the other hand, it is necessary, through research, to find new forms of service delivery that are more effective, efficient and widely accepted by the population.

The WHO ad hoc Committee on Health Research (Committee on Health Research Relating to Future Intervention Options, 1996) says that "important efforts must be concentrated on the improvement of the information bases so that governments may incorporate health into their development plans and do a follow-up of the performance of their health systems. To this effect it is necessary to come to agreements on *input* and *products* indicators and, as far as possible, adopt common measures on *health requirements* such as the burden of disease".

And it recommends priority actions in the following three fields:

1. Promotion of generic and comparative research in health systems and policies.
2. Development of performance indicators and tools to support the application of policies.
3. Support national research programs on health systems and policies.

Without ruling out other possible areas, the following will undoubtedly concentrate increasing attention in the next fifteen years.

*Health conditions:* The development of monitoring systems of health conditions and their variations in terms of geographical and socioeconomic distribution, as well as their determinants. The provision of reliable and timely information to administrators and political decision makers.

*Universality:* To what extent are health systems approaching universality in terms of accessibility to health services? What are the access barriers that persist and what are the causes of this?

*Equity:* Is there a decrease in socio-economic, cultural, geographical health differentials? What are the causes of the persisting differentials?

*Effectiveness:* How much change, in terms of gained years of healthy life, is produced by the different interventions? This question will be increasingly applied, not only to biomedical interventions but to social policies and to diverse multisectoral interventions, according to the new health-disease paradigm. But apart from research on the “final” effectiveness of interventions, research on the “intermediate effectiveness” will be required such as the capacity of educational campaigns to modify knowledge and, eventually, health behavior, or of industrial policies to modify the cholesterol levels of the population, etc.

*Efficiency:* What is the cost-effectiveness of different interventions? Up to what extent do the new organizational forms, promoted by sectoral reforms, really lead to greater efficiency?

*Quality:* Apart from quality implicitly researched in the verification of effectiveness (results), the quality of processes will continue being researched, particularly as to the fulfillment of diagnostic and therapeutic protocols, and the levels of user and provider satisfaction.

*Intersectoral articulation:* Operative tools will have to be developed to achieve a functional intersectoral articulation, both at national and at state and municipal level.

*Comparative analysis:* Comparative studies at the level of different countries, different socio-cultural and economic contexts are of great importance today, given the relevance and extent of changes and the lack of contrast to the basic assumptions on which they are based.

No doubt, the areas described here are not mutually excluding and there is a certain overlapping of some of them. Research such as the study of the policy formulation processes may possibly be situated in more than one of these areas; the same applies to the macro and micro comparative analyses of the health system reforms. Similarly, the determination of which the most cost effective tools or interventions might be for a given aim in health, can be applied to practically all six areas, viewing the results in terms of effectiveness (years of healthy life gained) of equity (decrease in the differentials) of quality (processes, satisfaction), etc.

This field of research will be given both at the level of *policy* analysis and of the *programs* that develop them and, specifically of the *instruments*.

## Research Areas and Levels

	POLICIES	PROGRAMS	INSTRUMENTS
HEALTH CONDITIONS			
UNIVERSALITY			
EQUITY			
EFFECTIVENESS			
EFFICIENCY			
QUALITY			
INTERSECTORIALITY			

The above matrix helps understand the possible interactions and the different complexity levels of research in public health and health systems. On one hand, research is required in each of the different complexity levels (horizontal): at policy (macro) level, at program (mid) level and at instrument (micro) level. On the other hand, a vertical analysis is also required, contemplating possible interactions between different policies, programs and instruments. Such is the case of interactions between policies oriented at equity and policies oriented at efficiency or policies oriented at quality, etc.

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# ENVIRONMENT AND HEALTH

*Roberto Belmar*

## 1. PRESENT HEALTH SITUATION AND NEW TRENDS TOWARDS THE FUTURE

1.1 As humanity has vertiginously developed in the present century, with a growth and modernization rhythm that has grown after the Second World War, human health has also experimented deep changes, and new challenges and paradigms concerning the effectiveness of health systems of all the countries, have been configured.

Changes and progress experimented on both health and health systems, started in the industrial revolution, as a result of the improvement of people's living conditions (Mc Kwen, 68 and Belmar, 82) and the great scientific advances. Mc Kwen was able to demonstrate that TB and many other infectious diseases improved substantially as an effect of better conditions of nutrition, housing and basic sewage systems in England, which had an even more significant influence than the achievements in health action itself. This situation was corroborated by Belmar, who established that per capita income was the variable which had the highest correlation with the main health indicators in Latin America.

Modern medicine, sprung from the fundamental contributions of Pasteur, Jenner, Koch, and other researchers, has developed immunization techniques, treatments, surgical procedures, improvements in the care of pregnancy, delivery, puerperium, as well as environmental improvements, which have changed the course of the diseases and health problems. In addition to that, the improvement in people's quality of living, has produced a remarkable fall of mortality, especially that concerning infectious diseases.

This global situation has also developed in the American continent, although it is recognised that there's a wide gap between the countries with better health levels and those with low achievements in public health, remarking a high inequity among the countries and within the countries themselves. The factors which explain this lack of equity are: per capita income, ethnicity, gender, rurality, marginality and social class.

1.2- In the Americas, the effects of these processes determine that nowadays the challenges of the American countries' health systems are

connected to such situations as the demographic and epidemiologic transition, the rise of social marginality, the existence of important groups of poor and extreme poverty, the situation of the American ethnic groups and and ethnic groups which immigrated in the continent, the situation of women suffering permanently from social, community, labor and familiar discrimination, the steady growth and development of the macropolis with its consequent risks of marginality and health problems associated with living in high population density, the existence of spread and unprotected rural communities and the market relations which are unfavourable for the countries which export raw material sand food.

These multiple challenges on health systems, determine the need that organizations such as the Pan American Health Organization (PAHO), have the task of identifying these social problems and their relation with people's health and health systems, weighting their specific role on health problems, as well as establishing the most cost-effective mechanisms to prevent (anticipate) or mitigate their effects on human health and on the environment.

Apart from these problems, which have sistematically devastated the Americas, the problem of the low efficiency and effectiveness of the countries' health systems has emerged, which makes facing the people's health problems much more difficult, particularly in the poor, isolated communities, workers, women, youngsters and the elderly.

## 2. SUBJECT AREA DELIMITATION AND DEFINITIONS

2.1. As soon as the last decade of the millennium finishes, the next one begins with the conviction that the greatest achievement of the human race is and will be "to reach a sustainable development with equity" (World Bank, 92). The concept "sustainable development" is based on an enhanced human being (empowerment) to preserve and maximize his health and education in a protected environment, where there should be a synergism between environment and development (Dasgupta & Maler, 91). It should be remarked that in spite of the great technical progress, there are still millions of poor and poverty intimately linked to environmental damage, making it difficult to determine what was first, although it is now clear that one is enhanced by the other (Valladares, 93 and CIEPLAN, 91). In fact, the most important aspect of development is to increase the hundred million of poors' capacities to incorporate to the social and economic process and so improve their quality of life (World Bank, World Development Report, 92). The relation environment-development is a new concept (Lutz, 91), since it used to be frequently said that "the environmental resources have a secondary importance for poor countries" "such resources (environmental ones) are luxurious goods and they only have certain gravitation in the public consciousness where there are high incomes" (Dasgupta & Maler, 91).

2.2. Nowadays it is general agreement that the hope for development is based on a protected environment, which is expressed in "environmental equity", meaning biologically and chemically clean water, unpolluted air, soils which are nourished and free of heavy metals and pesticides, a stressless labour place without acoustic, biologic or chemical polluting agents, and a macro-environment which shows the normal development of species and human culture in harmony, from the physical (temperature, radiation and composition of atmosphere suitable to life); chemical (the creation of new compounds (Cometer,83)); biological (sewage disposal, and treatment of the by-products of development, suitable final disposition of pesticides); psychological (control family and social violence, international legislation suitable to the macro environment); and e social (equity and human rights) points of view.

2.3. The previous paradigm concerning "environmental equity", is being permanently challenged by great problems both in the world's macro-environment and in the local one (Commener, 83, World Development Report, 1992, Dubos, 82). The main problems threatening the sphere's macro-environment are:

- Warming up of the atmosphere.
- The ozone layer's thinning.
- The process of desertification.
- The reduction of fresh water due to the salinization process.
- The progressive devastation of the tropical and rain forests.
- The loss of arable lands.
- The accelerated disappearance of animal and vegetal species.
- The accelerated urbanization and the development of "macropolis".

In the local and specific environment of countries and regions, we can identify serious processes, which deteriorate the environment and remove the possibility of hoping for environmental equity. The harshest processes identified nowadays with the deterioration of the local environment are:

- The physical, chemical and biological pollution of the atmosphere.
- The specific physical and biological pollution of water used by humans.
- The water, soil and work environment pollution caused by heavy metals (Pb, As, Cr, Al)
- The presence of pesticides, herbicides and fungicides in the water and soil.
- The increase of human contact with solvents.
- The increase of solid waste from cities and industrial processes.
- The lack (absence) of solutions regarding the final disposition of radioactive wastes.

2.4. This long list at a world and local level, tends to grow particularly in the poor countries where it has been seen that atmospheric pollution caused by breathing particles and gases (SO<sub>2</sub>) has grown, whereas it has

fallen in more developed countries. This shows that this kind of increase can be controlled by present day technology. (World Development Report, 92).

2.5. There are different tendencies in Latin America -LA- which tend to make the macro-environment and local environment problems even more complex. These tendencies in the present reality of Latin America are:

2.5.1. The population trend to migrate to bigger cities (macropolis). The population in the region is 8% of the global population and its 20 countries in 1992 have a population of 430,2 million inhabitants in an area of more than 20 million square kilometres. The urban population has grown from 40% in 1950, and is projected to reach 75% in the year 2000. In 1950, 17 million people lived in cities with over one million inhabitants. This grew to 132 million in 1990 and 232 million are expected in the year 2000 (UN, 83, CELADE, 91). There are 11 cities with a population over 3 million. In ten years' time, LA will have the biggest cities in the world, increasing its urban population from 346 (1990) to 447 million in the year 2000 (ECO, Environmental Epidemiology, 93).

This situation is particularly worrying since the fact of living in megalopolis (more than 3 million) conveys social phenomena like marginality, drug addiction, and different ways of violence. In addition to that, there are alterations in the environment with problems such as the final excretes disposal, atmospheric pollution, indoor pollution, and the impossibility of dealing with solid wastes and crowding (Belmar, 93). PAHO studies have analyzed and quantified health and social risks of this way of living in big cities, which will be the most frequent in the next millennium (PAHO, 92).

2.5.2. The changes in climate caused by the modification of the El Niño Current which has meant the rising of the temperature in the Pacific Ocean. The hypothesis of this warming up of the Pacific has been attributed not only to the effect of human action, but also to the increase of rain in the central Pacific. (Monastersky, 95).

2.5.3. The thinning of the ozone layer in the south of the south american continent (ECO, Environmental epidemiology, 92, Lipkin, 95) is determining an increase in the ultra violet radiation with its consequent effect on human health as well as on the health of other animals and vegetal species. This effect on the protector ozone layer (12 to 50 km surface) would be caused by the increase of flurocarbides and molecules with chlorine and bromine of high stability which destroy the ozone.

The thinning of this ozone layer is even more noticeable on the Antarctic and south of the American continent, creating what is called the "Ozone Hole". This process is being progressively developed, thinning this protector layer from 2% to 4% by decade. A thinning on the Artic has also been noticed , with a fall of Ozone of 35% compared with measures

from 1979 (World Meteorological Organization, 94 and NASA's Upper Atmosphere Research Satellite, 94)

2.6. To this factors: "macropolization" of Latin America, climate changes and the Ozone Hole in the south region of America, we should add other tendencies which have already been identified by the group and which are changing the health scenario in Latin America. These general trends are: the demographic and epidemiologic transition, changes on lifestyles, the new economic pattern of exporting markets; and the keeping and even worsening of social inequity, particularly affecting the poorest groups.

### 3. THE PROBLEM OF HEALTH AS A RESULT OF ENVIRONMENTAL DETERIORATION

The environmental changes which are taking place in Latin America have negative effects on the health of human beings. To delimitate these effects on health it is necessary to take each environmental factor and identify the risks and the health harm and the effects that have been identified on the health of the inhabitants of the region concerned.

3.1. Environment damage will be analyzed related to pollution or to changes being developed in the water, sewage, atmosphere and indoor air, soil and workplaces.

3.1.1. *Water* The water resource needed for human activity includes water for domestic consumption, water for watering and water as a part of the industrial process.

The quality of drinking water is determined by counting the coliform colonies every 100 millilitres. When domestic water is polluted, it creates the risks of enteric pathologies. Pathologies associated with bad quality of water (over 1000 coliform colonies every 100 millilitres) are: cholera, typhoid and paratyphoid fever, and salmonella, infectious, hepatitis, unspecific viral and bacterial diarrhoea, enteroparasitosis (Amebiasis, Balantidiasis, Isosporosis, Hymenolepidiasis, Ascaridiasis Tricocefalosis, Oxyuriasis). Except for cholera, all these enteric diseases are endemic in the region and they are closely associated with the lack of healthy drinking water. These phenomena are particularly prevalent in the rural environment where one out of three people doesn't have healthy drinking water. In the urban environment, the percentage of healthy water has improved, remaining mostly the marginal sectors of the macropolis without a healthy water supply. Another factor which is worth knowing, is the so called transported water, since it can be initially healthy but it is contaminated in the transport process. That's the reason why the term healthy water isn't just a bacteriological concept, but also a concept of indoor connection.

The availability of water for domestic use, is another factor which must be considered, since a person needs from 15 to 30 litres of water

to drink and 50 litres for personal cleanliness. It should be said that the elimination of excreta also requires water and it is the factor of highest water consumption in the cities, between 80 and 100 litres per person a day.

Water in the agricultural process is an important factor in human health, since the groups that have an unsuitable quantity of water for irrigation, show an important prevalence of malnutrition. This is even more remarkable in dry lands ( the ones with a lack of water for cultivation). This situation has been demonstrated by studies in the dry lands of the coasts in Chile. (Mardones, 92). A situation like this can be appreciated in the Brazilian northwest and in the high plateau and desert zones of the continent. Another environmental phenomenon consisting in the progressive loss of rainfalls, can be identified in these regions, since it is associated with the felling of the forests and brushwoods to use as domestic and industrial fuel. This desertification is developing at a speed of 6 million hectares a year. (World Commission on Environment and Development, 87). Another dimension of the damage on water resources consists in its progressive salinization (WB. World Development Report, 92).

Water in industrial processes, is related to health when these processes contaminate this water with heavy metals like Arsenic, Aluminum, Fluoride, Chrome, etc., as well as when this resource, water, is overused where it is not renewable, like in the high plateau zone shared by Perú, Chile and Bolivia. Later, the effects of the water polluting agents on health will be analyzed separately.

The World Bank has made a prospective simulation study of the efficient use of the healthy water resource in three scenarios since 1990. The first one consists in keeping the present situation, the second, in investing in supplying healthy water, and the third one consists in handling the water resource efficiently. In the first scenario there would be a billion people without healthy water in the '90s, 1.5 billion in the 2000s and 2.5 billion people in the 2030s. In the second scenario, investing in water, there would be 1.9 billion people in the 2000s and 1.8 billion in the 2030s. In the third scenario, the number of people without healthy water would fall to half a billion and by the 2030s there wouldn't be people without healthy water (World Bank, Anderson & Cavendis, 90).

3.1.2. *Sewage*. Nowadays, there are more than 1.8 billion people in the world without appropriate sewage systems. This situation, without deep changes, will increase to 3.5 billion people in the 2030. The situation in Latin America is as serious as in the rest of the world, one person in four in LA, doesn't have an appropriate sewage system and this figure is doubled in the rural and marginal urban areas (PAHO, Health Conditions of the Americas).

Countries haven't paid attention to their sewage systems for decades, and they pour wastes in rivers, lakes, seas, with the consequent risks of

contamination in drinking water, food and kitchen utensils. Only 2% of sewage water is treated (World Bank, 92). An example of this unforeseeing action is the cholera epidemic that still beats LA. The loss of human lives, labor and study days; the costs of confronting the epidemic and the lost or limited agricultural and fishing markets are examples of the economic and social risks of measures which cause detriment to the environment as well as to human health. Yet, there is a higher risk: if the plancton gets contaminated and the temperature of the sea increases because of the "El Niño current", we'll have the risk of the vibrio's reproduction in this plancton, creating an endemic condition of cholera infection by sea products, especially in bivalve filtering molluscs; as well as the risks of an incalculable damage on the fishing industry.

The same World Bank's simulation study, regarding sewage matters, predicts that only by investing on the sewage system, the numbers will drop to 2.2 billion people without sewage systems in the 2030s, and numbers could even fall to 1.8 billion in the same date, 2030, by investing and applying more reforms of efficiency in the basic sewage systems (World Bank).

3.1.3. *Atmosphere*. The atmosphere is the permanent receptor of the results of human activity, which remain there or turn into other components which damage man. The physic alterations physical suffered by the atmosphere are the following:

a. A temperature rise caused by the increase of gases of the "greenhouse effect" type, such as CO<sub>2</sub>, CO, Methane, fluorocarbons and Nitrogen oxides and the increase of solar radiation caused by the progressive thinning of the ozone layer. CO<sub>2</sub>, which represents 65% of the greenhouse effect, has increased 12% in the last thirty years, as a result of the doubling in its emissions (Rivero, 93). The temperature changes registered since 1880 have shown an increase of more than 1° C in that period of 110 years. (Houghton, 90 and Monastersksy, 95). This information would let us assume that global temperature increases 0.1° C a decade in the globe, if there aren't any deep changes in the emission of greenhouse type gases. Up to now, countries haven't been able to reach an agreement on a real decision which controls these emissions.

b. The thinning of Ozone layer, which protects from the ultraviolet radiation, from 20% to 35% in the last 20 years, as has already been analyzed in 1.4. Every 1% of ozone decay, conveys an increase of 2% of ultraviolet radiation in the atmosphere. (Rivero, 93).

c. Changes in the prevalent direction of winds are difficulting the exchange with an ozone richer air, which is necessary to improve the situation of the Ozone Hole in the south of the continent.

d. Local changes such as the thermal inversion phenomenon, which is the result of having founded cities in river basins surrounded by mountains or near the sea with winds coming from the sea in the highland winds areas (anti-Trade Winds). (Romero 88 and Belmar, 89).

The presence of a layer of lower temperature which prevents from clearing the air of the basin, produces two effects: the first one is that the emissions of the city remain trapped in the basin and polluting agents can only be removed by winds over 50 knts/hour; and the second, refers to the low temperatures that make the inversion layer fall, and so the polluting agents concentration increases in those cities. (Romero, 88). Another factor in the basin's thermal inversion is that contamination tends to spread homogeneously on the whole basin. This is due to the fact that during the day, the inner basin winds under the thermal inversion layer go up the basin's hillsides carrying the polluting agents with them, and at night the winds go to the basin's center (anabatic and catabatic winds respectively) which results in a permanent air mixture under the thermal inversion layer.

This phenomenon conveys aggravating circumstances which imply that among these polluting gases that go up the basin's hillsides, are Nitrogen oxides which together with solar radiation and the hillsides unprotected of vegetation, produce the secondary oxidation of the Nitrogen oxide, of  $SO_2$ , and oxygen, creating the *Secondary Oxidants such as Ozone,  $NO_2$ ,  $SO_3$ ,  $H_2SO_4$ , and sulphates.* (Environmental Epidemiology, 93).

This phenomenon has been demonstrated by studies in the Santiago de Chile basin, where the hillsides are over 1.000 metres above the city's plan. In the summer, the air temperature makes the inversion layer go up over the 1.000 metres of the basin's hillsides, whereas in winter, with temperatures of 1 or 3°C, the inversion layer reaches 200 metres, lowering four or five times the volume below the inversion layer with the consequent increase in the concentration of the atmospheric polluting agents. (Romero, 88).

This situation determines that in cities like Santiago, some degree of emissions from the basin will always be trapped, so that there will always be atmospheric pollution in that kind of cities. The other Latin American cities which would run the same risk are: La Paz, Medellín, Quito, México, Guatemala City and Bogotá.

The atmospheric composition alterations are produced by the emission of new substances or by the increase of the normal composition of the air. These components are:

a. *Particles in suspension.* Sources such as engines, industrial processes, chimneys, street dust, the burning of grass or rubbish, bring in low weight particles of between 500 and 0.2 microns. Several studies have determined that these particles can have a geologic origin or they can come from human processes. The first ones, which are dusts, have tracers such as lanthanic components of over 10 microns, which makes them unbreathable (they can't penetrate the lung's alveoli), and the ones produced by man are generally below 10 microns which makes them inhalable. In addition to that, they behave as aerosols, having a super-

ficial *adsorption* which adheres substances produced by the industrial process and by engines, such as Lead, Arsenic, asbestos and benzo-pirenes (Préndez, 81 and Belmar, 93).

This adsorption phenomenon is very important because these adhered substances in inhalable particles, penetrate the breathing system through the lung alveoli. This explains the growing Lead levels in the blood of the inhabitants of countries where there's still Lead in gasoline. (Romieu, 90 and Belmar, 91)

Another noxious factor to analyze is the role of diesel engines in relation to the inhalable particles. These engines, even the best maintained ones, produce diesel particles which aren't combustionable in the explosion caused by the engine compression, making people inhale diesel, carrying the risks of the hydrogen carbide and particularly, the risk of the benzo-pirenes, which are cancerogenic in relation to the Bronchogenic Cancers (Gil, 92). Also, asbestos coming from brakes, ballades and thermic insulation materials, are inserted as aerial particles conveying the risks of Bronchogenic Cancer and particularly of mesotelioma (Gil, 92). Studies in Chile have demonstrated that 72% of the inhalable particles come from Diesel engines (Transport Ministry of Chile, 87). All these particles settle down when urban activity diminishes, but the following day, when the activity is reinitiated, they are suspended again, together with the new particles emitted. Then, there is a permanent TSP adding, except when they are actively eliminated from the urban environment by the action of wind, rain, and when they are swept and sucked up. (Belmar, 93).

The production of particles in LA is alarming. Several studies have quantified these emissions in Belo Horizonte (43,000 tons/year), Rio de Janeiro (120,000 tons/year), Porto Alegre (42,000 tons/year), Santiago (46,000 tons/year), México (449,000 tons/year), Ciudad de Panama (17,000 tons/year), Caracas (30,000 tons/year) and Buenos Aires (4,00 tons/year) (ECO, 93). This has determined that most of the biggest cities in LA, are over WHO's standards for total suspension particles -TSP-. It is calculated that 50% of the 60-90 micrograms/m<sup>3</sup> geometrical average/year, are inhalable particles (PM10). That's why the phenomenon of surpassing the WHO recommendations regarding the TST has been quantified, in cities such as Mexico, São Paulo, Santiago and Rio (Romieu, 90). More than 65 million people who live in these cities are under these particles' risks.

It has also been determined by studies that the PM10 (inhalable particles) have the capacity of diminishing the cities' luminosity and are the cause of a more frequent darkness, making it difficult to see the mountains surrounding the area. (Prendez, 81). This capacity is even more important in the particles of smaller diameter and would be associated with the risk of psychologig depression. (Prendez, 81 and Belmar, 93).

b. Carbon dioxide -CO<sub>2</sub>-. This gas has increased since the pre-industrial times figures from 228ppm (1800) to 350 ppm (1990), with an annual increase of 0.4% (Rivero,93). This increase is responsible for 65% of the increase in temperature, as a result of the greenhouse effect.

The results of this are: changes in the climate, alteration in the species evolution, desertification and heating of the oceans.

c. Carbon monoxide -CO- This gas is closely related to incomplete combustion and to the emissions of all the engines. Studies in Mexico and Santiago have demonstrated high CO concentrations especially in busy streets, surpassing the level of 9ppm (ECO, Environmental Epidemiology, 93 and Escudero,83). It has been reported that in Rio emissions reach 940,000 tons/year, in Santiago 280,000 tons/year, in México 3,000 000 tons/year, in Buenos Aires 240,000 tons/year and in Panamá 230,000 tons/year (ECO, Environmental Epidemiology,93).

As it has been demonstrated by studies, more than 125 million people in LA live in big cities where there's a high exposure to CO. These populations are growing 1.9%/year, adding more than 2.3 million people a year (ECO, Env. Epid.,93) which determines that if the growing rate doesn't change, these exposed populations will be 150 million in the year 2000, 180 million in the year 2010 and over 200 million in the year 2020.

d. Sulphur derivatives SO<sub>2</sub>, SO<sub>3</sub> and H<sub>2</sub>SO<sub>4</sub>. The most frequent one of these sulphur derivatives is sulphur anhydride - SO<sub>2</sub>-. This polluting agent derives from industrial processes, combustion of mineral coal, thermoelectric plants, Diesel and petrol emissions and any process of combustion where Sulphur is burnt.

The SO<sub>2</sub> emissions in cities are: 110,000 tons /year in Rio, 22,000 tons/year in Santiago, 200,000 tons/year in México, 230,000 tons/year in Panamá and 35,000 in Buenos Aires (ECO,93). These emissions determine a surpassing of WHO's annual standard of an arithmetical average 40-60 µg/m<sup>3</sup> in Ciudad de México and São Paulo (Romieu, 90 and ECO,93).

The populations exposed to this polluting agent, are similar to the ones related to CO, 125 million (95), with the probability of increasing the number of copper mine workers, workers in hydrocarbon plants, drivers and those workers connected with diesel cars, to reach 200 million in 2020.

The SO<sub>2</sub> oxides in the atmosphere due to photochemical processes, giving birth to the SO<sub>3</sub> and sulphuric acid, which are the basis of what is called acid rain. In the severe acute processes of atmospheric contamination, Mosa in Belgium (1930), Donora, Penn. (1948), London (1952), Poza Rica in México (1950) there have always been Sulphur derivatives which are enhanced with the suspension particles (Rivero, 93).

f. Nitrogen derivatives. NO<sub>x</sub>. The Nitrogen oxide- NO- is mainly emitted by gasoline engines (2/3 approximately), and the remaining third comes

from industry. This compound is oxidized by the photochemical processes of atmosphere, giving birth to one of the compounds of secondary oxidation in the atmosphere. It also appears when liquid gas (butane and propane) is used indoors. These compounds' emissions are important in cities of Latin America, 128,000 tons/year in Rio, 12,000 in Santiago, 37,000 in Panamá, 29,000 in Caracas, 100,000 in Buenos Aires. NO<sub>2</sub> measures have determined that they surpass the WHO standard of 150 µg/m<sup>3</sup> in 24 hours in Santiago and México. In addition to that, WHO's standard of 100µg/m<sup>3</sup> a year is surpassed in São Paulo and México (Weitzenfeld, 92 and ECO, 93). The urban population under risk is the one previously specified.

g. Ozone. A secondary oxidant, resulting from the photochemical processes and a main component of these, as established in paragraph 2.1.3.d. It has been shown that México and Santiago -for their particular basins, luminosity, lack of vegetation in hillsides, and abundance of Nitrogen oxides and hydro carbides- have made the formation of this polluting agent easier (Romieu, 93 and Belmar, 93). Also, in São Paulo and Rio there are conditions to generate an Ozone excess (ECO, 93 and WHO/UNEP, 92). The WHO standard of 0.1 ppm has been surpassed many times in Santiago, México, and São Paulo (Weitzenfeld, 92 and Rivero, 93). The population under risk is similar to the one under other polluting agents' risks.

h. Hydrocarbons. These hydrocarbons are emitted by car engines (69%), industry and gas stations (31%) (Rivero, 93). These polluting agents are an important component of the photochemical process to generate secondary oxidants. In addition, diesel engines produce aerosols of hydrocarbons which compose 72% of the inhalable particles and in Santiago they have benzopirenes (Prendez, 91). The worst pollution situation is in Cubatão, Brazil with levels of contamination without parallel in LA; aerosols over 60 to 240 µg/m<sup>3</sup>, since 1985. (Hofmeister, 91).

i. Heavy Metals. Particles of certain metals such as Lead, Arsenic (Sandoval, 72), Mercury (vapour) (Malm, 91), Aluminum, Nickel, Manganese, Cadmium, Chrome, and Zinc, can be found suspended in the air as a result of industrial processes, gasoline with Pb as an anti-explosive, and the burning of incinerators. (Orrini, 92). Pb comes from Pb tetraethyl which is added to gasoline. The standard of 1.5µg/m<sup>3</sup>, is surpassed in cities and this polluting agent exists in the air as well as in the dust of the streets and highways in all LA, being the population of 500 million exposed to this polluting agent, particularly the children who increase their exposure by ingesting it with dust. (Préndez, 91)

j. Other atmosphere elements. Asbestos particles of brakes, ballades and insulation materials, have also been detected, as well as formaldehyde and other aromatic products associated to industry. (Belmar, 93).

Summarizing, the urban atmosphere in LA shows a high level of all the known polluting agents, reaching severity levels, not shown in other

countries, such as the PM10 level in Santiago, México and São Paulo, the secondary oxidant levels in México and Santiago, the level of hydrocarbons in Cubatão (Brazil) and the Hg contamination in the gold mines of the Amazon, even recognizing that there hasn't been a suitable tracking of contamination in many cities and labour processes. (ECO, 93)

3.1.4. Indoor contamination. Houses are exposed to severe air contamination because of tobacco smoke, domestic fuels (firewood, coal, paraffin and butane), dust and construction materials (radon), which generates a closed and highly contaminated atmosphere. It is remarkable that people spend more than 12 hours at home and young children and the elderly spend most of the day at home. (Samet, 87). The use of domestic fuels and the liberation of CO particles and pyro-ligneous acid -which is identified as cancerogenic- has been studied before (Chen, 90). Studies in Guatemala have demonstrated the problems associated to this risk. (Smith, 93).

The population exposed to this problem is very large, because it has been shown that 20% of the adult population smokes, 7% uses firewood or coal as domestic fuel, and 35% uses kerosene. This is even more prevalent in the southern part of America, where firewood is the most frequent fuel. (Belmar, 93).

3.1.5. Soil contamination. Industrial processes, agricultural industry, mining - specially open mining- and city waste are polluting LA. The most frequent soil polluting agents are:

a. Arsenic, which is mainly generated in copper mining. The copper mine rewashings, contaminates the soils as well as the deep water layers with As. Studies in Antofagasta and Quinteros, Chile; San Luis de Potosí México; Salta, Argentina; Lamarão do Passo and Sepetiba, Brazil; The Bolivian high plateau and the south of Perú, have registered the presence of As in the soil (ECO, 93).

b. Lead. Its presence as a component of gasoline which is left in soils, cities and highways in all LA, has already been analyzed. Studies have demonstrated the systematic presence of Pb in blood. In Chile it has been demonstrated that the population had Pb levels ranging between 4.77 and 13.33 µg/dl, with an average of 5.4 µg/dl in the exposed population. However, this level rises to 7.35 µg/dl in children under 5. This is serious because we know the 1:2 rule, which says that as a result of continuous exposition to Pb blood levels rise twice as much. (Grant, 85).

c. Mercury. It has been said that there is Hg in the mining process in Brazil (Garipos), when it is used as a fungicide and in the wastes of the production of chloride/alkali in Brazil (Carvalho, 85), in Nicaragua in chloride/soda plants (Velásquez, Lacayo, Belmar, Lanrigan, 81)

d. Pesticides. The agricultural industry has increased the use of pesticides, herbicides and fungicides which has generated high exposures for the agricultural workers. An exhaustive study by a group lead by Mc Connel with the support of ECO, has been able to demonstrate that

agricultural workers are exposed to most of these products, including those which are strictly forbidden in industrialized countries. 30% of these have been forbidden in USA (Navarro, 84). Their use has increased 80% since 1983 (WHO, 90, Mc Connel, 93). However, the agricultural population has fallen down from 41% (1970) to 28% (1987) (Belloti, 90).

In all, there is not only a high exposure of agricultural workers to heavy metals, pesticides, herbicides and fungicides in LA, but also the wastes of these polluting agents appear in the food of the population in general. (ECO93)

3.1.6. Contamination of the workplace. There are several polluting agents in the workplace. Noises, heavy metals, pesticides and solvents have been identified as such.

a. Acoustic contamination. In the work space, there are sounds and noises which surpass the number of decibels a person can tolerate, and workers in general don't have auditory protection and even if they have it, they don't use it properly. (Sandoval, 92).

b. Heavy metals. This item was previously treated in 2.1.5. The economically active population is the one most exposed to this polluting agents, being the first in showing the noxious effects of these metals. Lead and Arsenic are the most frequent in the workplace.

c. Pesticides, Herbicides and Fungicides. These polluting agents have already been analyzed in 3.1.5.

d. Solvents. These organic compounds are liquids which are used in industrial processes and the exposure to them conveys health risks. These compounds are Alcohols, Aldehydes, Benzene, Toluene, Glycol, CS<sub>2</sub>, ethylene, ethers, n-hexane, formaldehyde and carbon tetra-chloride (Markowits, 93).

A third of the economically active population could be exposed to the risk of solvents, making it worse since an important number ignore the risks of this exposure. In addition to that, some solvents are in contact with general population because of the toxic wastes which come from industrial processes. (ECO, 93).

e. Toxic wastes and litter. Cities produce thousands of tons of rubbish a day and generally its final disposal is not the right one. Also industrial processes, agriculture, the fishing industry, mining, and the wood industry generate their own wastes, which generally are not disposed of properly and they turn into another kind of polluting agents (soil polluting agents). In this case, most of the inhabitants of LA are exposed to them.

Summarizing, there is almost an endless range of polluting agents in the water, air and soils in our continent which are affecting a large number of inhabitants. This exposure not only occurs in the cities and work places, but also in the rural area as well as indoors.

### 3.2 *Effects on human health*

The different polluting agents have diverse effects on the health of people, families and societies. These effects can be classified as: acute effects, cumulative effects and chronic effects.

As in all problems concerning human health, there are different ethiologic factors in the process of the multicausality of diseases. This is even more complex in contamination because different factors act simultaneously on the same organ producing the same physiopathological response. Ozone and SO<sub>2</sub>, for example, produce respiratory obstruction. This makes it difficult to identify specifically the pathologic action of each one of the polluting agents. What's more, certain factors enhance each other, resulting their combined effects greater than the sum of the specific effects of each polluting agent; this pathologic synergism is found, for example, between the inhalable particles and SO<sub>2</sub>, and also between cold weather and inhalable particles. In some cases, this has been accounted for, as in the case of cold weather in cities with thermal inversion, which acts by itself on the respiratory system and also when the thermal inversion layer concentrates polluting agents, particularly inhalable particles (Belmar, 93)

Another element to consider is that some variables which influence the effects of the polluting agents, tend to confound their real impact. These factors, which make it difficult to measure the pathologic impact of polluting agents, are the temperature variations, humidity, the smoking habit, the social smoker (pasive smoker), the presence of pre-existent pathologies, the characteristics of people, housing, people's occupation and social class. We have already seen how temperature confounds the effect of atmospheric polluting agents. Humidity modifies the bronchial response to the air polluting agents and also the level of exposure to pesticides. Smoking and the social exposure to tobacco smoke make it difficult to measure the effects of the atmospheric polluting agents. Research has demonstrated that in non smokers, the relative risk of obstructive chronic bronchitis increases 18% in their work place and 14% at home, when exposed to tobacco smoke. (Euler, 86, Belmar, 93) .Pre- existent diseases are confounding factors since they lower the response threshold to the effects of atmospheric contamination, the bronchial hiperreactive people show acute bronchial obstruction acceses in a lower level of atmospheric contamination than healthy population. (Castillejos, 88). Individual characteristics are also influential factors in the effects of the polluting agents, such as respiratory capacity in terms of the response to aerial polluting agents. Values of the physiological indicators change with the child's height (Aranda, 87). Housing also has an influence regarding the exposure to polluting agents in relation to the house's quality, crowding, air circulation, the dust inside, and to the different kinds of domestic fuel used (Belmar, 93). The work situations are related not only to the exposure to polluting agents,

but also to the procedures established to diminish or eliminate it. Finally, social class is another factor of importance since its education, income, and housing characterizations, modify the level and kind of exposure.

3.2.1. Acute effects of polluting agents. It is not necessary to go deeper in this area since it is here where most of the literature has allowed to know the effects of polluting agents. However, the concept of collision organ is noteworthy, being the one which commands the symptomatic response to certain polluting agents, for instance the lung to the air polluting agents, the central nervous system to Lead and Arsenic, blood to solvents and the skin and nervous system to pesticides. There's also a diversity of acute effects, the aerial polluting agents act on the respiratory system producing irritative effects as well as obstructive and inflammatory effects. (Belmar, 93).

Other acute effects can not be classified as diseases but simply as responses to polluting agents within the normal threshold. For example, cough as a response to atmospheric polluting agents and the reduction of the forced expiratory volume in the first second (FEV1) as the response to secondary oxidants. (Belmar, 93; Castillejos, 88; Hofmeister, 92).

-Cumulative effects. Several studies have determined that the effect of polluting agents on health are cumulative. For example, the prolonged exposure to atmospheric polluting agents, increase the risk of bronchial obstruction if this exposure is above the WHO standard ; it is associated to an increase of 18% in the relative risk of chronic bronchitis if this exposure surpasses 700 hours/year (Euler, 86). The exposure to cancerogenic substances such as benzo-pirenes can also be considered a cumulative effect of polluting agents (Gil, 92).

- Chronic effects. Studies have determined the chronic action of an obstructive kind, on the respiratory system in exposed children. Controlling by age, sex, height, bronchial hyperactivity, nicotinism, and domestic fuels, children in Santiago have a FEV1 of 96% and the children who are not exposed to the atmospheric contamination of Santiago (in the control city in the Andes mountains) have 100%; this difference of 4%, though within normal ranks, is statistically significant P.01 and shows the chronic effect of atmospheric contamination in exposed children (Belmar,89). Lead has also a noticeable chronic action on the central nervous system, blood pressure and IQ in children (Needleman,81). Arsenic has chronic effects on the skin, the central nervous system, blood, liver and cardiovascular system. (ECO,93). Pesticides have chronic effects on the nervous, dermatologic and respiratory systems, as well as potential chronic oncogenic capacity. (ECO,93; McConnel,88).

3.2.2. *The effects on the health of specific human beings* These are the effects on human health of different polluting agents or substances which act pathologically when they're present at concentrations or actions different from the usual ones. We shall briefly describe each one

of these elements, their known deleterious effects, a summary of the research or information of the negative effects in LA and the location of these problems in LA in relation to people, time and place.

3.2.2.1. Temperature variation. In spite of being a normal factor, temperature can act direct or indirectly in different situations such as the progressive heating of the atmosphere in the greenhouse effect, the direct action of low temperatures on the respiratory system, the increase in the concentration of atmospheric polluting agents by the action of temperatures over the thermal inversion, and the role of temperature in the process of desertification.

The greenhouse effect. The increase of temperature according to what was previously analyzed in 3.1.3, is around 0.1 °C every 10 years (Houghton and Monastersky,95) This progressive increase has not produced- up to now- any identifiable health problems. In LA it has been suggested that this increase in temperature has influenced or is the result of the so called El Niño Current (Monastersky,95). This has determined possible changes in plancton in Peru, Ecuador, in northern Chile and the south of Colombia. This increase in temperature and its effect on plancton could have determined the permanence and possibly the development of the Cholera epidemic which started in the ports of northern Peru and then spread to all countries in LA. This phenomenon, which started in 1991 has spread up to now, being all the coastal countries on the South Pacific affected, and with the probability of spreading out to the coastal countries of Central America and México.

The effect of cold weather on the respiratory system. Different studies on respiratory diseases have associated low temperatures as an independent variable in the ethiology and worsening of the high and low respiratory diseases. (Belmar,89). Later, other studies have been able to establish the inverse correlation between temperature and low respiratory infection. An increase of 1.3 C in temperature implies a decrease of 3.3% in the incidence of low respiratory diseases. (Astorga, Aranda,94)

The population exposed to low temperatures and its association with respiratory diseases, would be in the high plateau areas in LA and in the southern cone (south of Argentina and Chile). The population with highest risks for temperature effects are infants, preschool children, the elderly and the chronic respiratory ill. This phenomenon is more frequent in the winter months when minimum average temperatures are below 10°C (Aranda,94).

The effect of temperature on thermal inversion. In cities exposed to the thermal inversion phenomenon such as La Paz, Medellín, Guatemala, Santiago, Bogotá, Quito and México, temperature is the fundamental factor which concentrates the polluting agents when the inversion layer goes down. The population of the cities exposed to this phenomenon is 35 million inhabitants. This is even more intense in the months of lower temperatures. (ECO,93).

The process of desertification is part of the phenomenon of destruction of the vegetation and heating of the atmosphere. That is why the atmospheric heating process, 0.1°C every 10 years, is making this process increase, turning it into a permanent risk.

3.2.2.2. *Ozone*. This gas, which is naturally found in the atmosphere, has different effects on human health which have a relation with its decrease in the ionosphere (thinning of the ozone layer) and as an agent of direct contamination in the secondary oxidants on the respiratory system.

The thinning of the ozone layer. As was analyzed in 3.1.3, the progressive decrease (weakening) of the protective ozone action, which has been measured in the past 20 years, and was weighted for every 1% of the ozone decrease in the atmosphere, increases ultraviolet radiation by 2%. Ultraviolet radiation is associated to an increase in the incidence of skin cancer (Leaf, 89), cataracts, damage in the immune system, (Hersey, 83), and alterations in the photosynthesis of phytoplankton when this radiation penetrates several metres in the oceans, determining a lower production of oxygen which comes from placton (Rivero, 93) The exposed population corresponds to the inhabitants in the south of America and numbers 30 million. This phenomenon was detected 20 years ago and has a progressive course that diminishes the ozone layer by 1.75% in the places with lower intensity, in the Antarctica, Tierra del Fuego, the Chilean regions of Magallanes, Aysen, Los Lagos, La Araucanía and the Argentinian provinces of Santa Cruz, Chubut, Río Negro, and Neuquén. An increase in the incidence of skin cancer has been described in Punta Arenas as well as an increase in the incidence and the early appearance of cataracts .

Ozone acts on the respiratory system; under a low level exposure it reduces the FEV1 (Castillejos, 93), increases respiratory symptoms such as cough, hoarseness, sibilance, and nocturnal respiratory symptoms (Belmar, 93). When ozone concentrations are above the standard level, bronchial obstruction increases and it can cause asthma attacks (Rivero, 93). Finally, a high level and continuous exposure could be associated to the development of pneumo-pathologies in chronically obstructed children (Belmar, 93). Epidemiological studies with control groups have demonstrated the association of ozone with asthma attacks, determining a relative risk with the control group of 1.76. It was demonstrated in the same study that the respective relative risks were 1.79, 1.81, 1.31, and 3.77 in the high ozone concentration months, September, October, November and December. When all other polluting agents have decreased their concentration and only the secondary oxidants, particularly ozone, have increased their concentration, an increase of bronchial obstruction can be observed (CIE493) (Belmar, 89; ECO, 93).

3.2.2.3. *Inhalable Particles (PM10 and PM2.5)*. The World Bank has

established that particles which are suspended in the air, have decreased from the sixties to the nineties in high income countries and their levels are acceptable now. During the same period, they have also decreased in the medium incomes countries, although their levels are still unacceptable ( $200 \mu\text{g}/\text{m}^3$  of TSP). However, in the same period, in low incomes countries, they have increased, reaching the level of over  $300 \mu\text{g}/\text{m}^3$  of TSP. The exposure to unacceptable levels in urban populations affects 1.345 million people, producing from 300,000 to 700,000 premature deaths, which is equivalent to a 2% to 5% of all deaths in urban areas which have an excess of particles. A study in Santiago ( years 88-89) has associated the exposure to unacceptable levels of inhalable particles, to upper airway pathologies (rinopharyngitis, pharyngitis, and upper airway infections), demonstrating a relative risk of 4.39 in elderly adults. (Belmar, 89).

The influence of particles on the bronchial obstruction pattern was also observed, particularly in the months of higher concentration of particles (July and August) with a relative risk of 5.13 in July and RR of 3.36 in August (Belmar, 89; the previous findings had been described by other researchers like Ware, 86; Schwartz, 92; Riveros, 93) .Apart from the previous findings, the epidemiological study in Santiago establishes the association with pneumo pathologies with a relative risk of 2.77, showing higher risks in younger infants, RR3.31; older infants 5.5; pre-school children RR 4.56; school children 4.38; and adults 2.39. This association had not been demonstrated before. However, studies in Rio de Janeiro confirmed the association between particles suspended in the atmosphere and infant mortality due to pneumonia. (Penna, 91) Later, studies have been able to quantify this association showing a significant one between low temperatures and particles with pneumo pathologies. (Ostros, 95). In addition to that, it has been said recently that small particles, like those under 2.5 microns, are more harmful.

Once the inhalable particles effects on health have been identified, these can be interpreted as the particles' action on the defensive alveoli mechanisms, effects which facilitate alveolar obstruction which produces respiratory irritation such as cough and night respiratory symptoms (Ostros, 94; Belmar, 93; Dockery, 89). The adsorption phenomenon should also be remembered since it allows particles to be the mechanism that carries heavy metals, sulphates, and nitrates. (Rivero 93). Also, we must remember that particles have, together with  $\text{SO}_2$ , a synergetic effect in the respiratory system. (Ware, 86; Belmar, 89).

The Latin American populations which are exposed to PM10 are the large urban groups previously delimited to 125 million in 1995 and which will reach 200 million by 2020. This phenomenon, regarding time, has been weighted in LA since the seventies and is growing more than  $300 \mu\text{g}/\text{m}^3$  of PST a year (World Bank, 92). The ECO study, Environmental

Epidemiology, has demonstrated this increase in Santiago, México, and São Paulo, cities where the phenomenon is very intense. (ECO,93).

3.2.2.4. *Sulphur anhydride (SO<sub>2</sub>)* This Sulphur derivative has demonstrated the capacity of irritating and developing bronchial obstruction (Rivero, 93). SO<sub>2</sub> is a respiratory irritant highly soluble on the airways' surface. This determines that most SO<sub>2</sub> is absorbed in the nose and in the upper system, so that a small part of it gets to the lungs (Rivero, 93). Experimental studies on rats have established that high concentrations of SO<sub>2</sub> provoke interstitial pneumonia, bronchitis, and tracheitis (Rivero, 93). Under concentrations of 0.5 ppm of SO<sub>2</sub>, it produces significant bronchial obstructions in asthmatic people during moderate exercising, which is worsened under low temperatures (Linn, 84). Apart from the respiratory effects, SO<sub>2</sub> has irritating effects on eyes. (ECO, 93). The synergic action with particles determines that 250 µg/m<sup>3</sup> and 300 µg/m<sup>3</sup> of both of them, increase the respiratory morbidity in adults and possibly in children; at 400 µg/m<sup>3</sup> of both components, there is a severe increase in respiratory morbidity; and an increase in mortality has been detected over 500 µg/m<sup>3</sup> of both components like in the cases of London 92, Mosa 30, Donora,48 and Poza Rica in 1950. (ECO, 93; Rivero, 93)

Several studies in LA have demonstrated the SO<sub>2</sub> effect on health in different places: in Santiago de Chile, for example, the effects of SO<sub>2</sub> on respiratory irritative symptoms (cough, sibilance, hoarseness and nocturnal respiratory symptoms) have been demonstrated, as well as the increase of respiratory obstruction episodes, and a significant increase in mortality when associated with the increase of particles.

3.2.2.5. *Nitrogene derivatives* The NO<sub>2</sub> effects on health are related to a potential increase of respiratory disease among children (Romieu, 90). Epidemiologic studies have demonstrated an increase in the reactivity asthmatics, and changes in their pulmonary functions.

Since this gas has been found in the indoor contamination due to the use of liquid gas as a domestic fuel, studies have established its effects on respiratory disease in children (Sumer, 87; Speizer, 80). As the NO<sub>2</sub> is generally related with ozone, it is difficult to distinguish its pathogenic action from the ozone's, since when the winter polluting agents fall as particles and SO<sub>2</sub>, the NO<sub>2</sub> goes up together with the ozone in Spring and Summer. The cities which have high NO<sub>2</sub> levels, over 100µg/m<sup>3</sup>, are Mexico, São Paulo, and sometimes Santiago, so the actual exposed population to these levels is 43 million. (ECO, 93) The measurements of this gas in LA started in the seventies.

3.2.2.6. *Carbon monoxide (CO)* Its importance on health is based on the fact that it establishes a connection with haemoglobin, preventing its removal from the blood. CO has 240 times higher affinity with haemoglobin than oxygen. (Rivero,93) The exposure to this gas should not be over 13 ppm in an eight hours average. This situation determines that in high CO

concentration cities, the general population has 5% of its haemoglobin blocked and if the person smokes, it can reach 17%. This situation determines that hypoxia is related to the increase of hospitalized cases of myocardial infarction in areas with CO<sub>2</sub> levels between 8 and 14 ppm (Hexter, 71). This haemoglobin blockade is high mostly in people who work in busy streets, public transport drivers, street hawkers and transit policemen. The at risk groups in LA belong to the big busy cities which have more than 125 million inhabitants. There are also individual risks in pregnant women, smokers, chronic lung processes with hypoxia and cardiovascular patients. Several studies in LA have not been able to establish a relation between myocardial infarction and high levels of CO<sub>2</sub>.

3.2.2.7. *Hydrocarbons* As was previously seen, hydrocarbons are part of the suspended particles due to the high concentration of hydrocarbon aerosols in the suspended particles. (Belmar, 89). Then, their effects on health will be the same as those already discussed in the chapter devoted to particles. However, besides these actions, the presence of benzopirenes in hydrocarbons, which have a demonstrated cancerogenic capacity, must be remembered. (Gil, 92). Studies have established the risk of the increased incidence of lung cancer associated to the exposure to hydrocarbons due to the increased number of cars in the cities and the inadequate sale of hydrocarbons (Gil, 91; Belmar, 93).

3.2.2.8. *Lead -Pb-* This heavy metal has clear deleterious effects on human health, showing effects on the digestive system, the central nervous system, blood, arterial pressure, and IQ. As the exposure levels to environmental contamination are lower than those connected to labour exposure and ingestion of Pb, the more frequent effects are alterations in school capacity in children when the exposures increase the Pb level in blood over 15 µg/dl of blood (Needleman, 91). An increase in pressure has also been described. The permissible epidemiologic level, has diminished to 10 µg /dl, the highest permissible clinical level is 25 µg/dl; the hematotoxic level is 40 µg/dl ; and the neurotoxic level (encephalo pathology) is 50 µg/dl (Grant, 81 and EPA, Regulations, 85). Being LA the producer of 14% of Pb, the risks of labour contamination are still high and as Pb continues being incorporated to gasoline as antiexplosive, lead levels have been found in the population in general. In Chile the level reaches 5.4 µg/dl ; in Mexico city samples, the level reaches between 3.4 and 25µg/dl, with 80% of the children over 10 µg/dl (ECO, Cebrian, 93); in Brazil the children of those parents who work in Pb processor plants have 59 µg/dl (Carvalho, 84). Other sources are pottery with Pb paintings, canned food and drinking water seals. Pb in the blood has been measured in Guatemala, República Dominicana, Honduras, Perú and Nicaragua (ECO, 93). The exposed population has not been quantified and this contamination has existed in LA for a long time.

3.2.2.9. *Arsenic.* As. has effects on health related to its cancerogenic

action, skin lesions, anaemia, CNS alterations and the production of chromosomal aberrations (ECO, 93). Some of these effects have been identified in Antofagasta in Chile, San Luis de Potosi in México, in Salta in Argentina, Brazil and Bolivia (ECO, 93). Several kinds of cancer have been observed after the exposure to this metal in water and in metallurgical workers (Rivero, 91). An increase in cancer has been detected specifically in Antofagasta where a quarter million people have been exposed to arsenic in their drinking water for 12 years, with the effects of an annual incidence of arsenical dermatosis of 20 per 100.000. An increase in cancer has also been detected when comparing with the rest of the country with a relative risk of 20 for bladder cancer, RR 6.9 in liver, RR 5.7 in kidney and RR 3.4 in larynx. In addition, the relative risk for cardiac ischemia was 1.9 and 3.1 in chronic respiratory diseases (Rivara, 92). In Argentina, endemic areas with arsenic in drinking water in Cordoba demonstrated that 24% of deaths were caused by cancer, when comparatively the province of Córdoba had only 25% (ECO, 93). The population exposed to arsenic is mainly the population exposed to drinking water with arsenic and the people who live near the chimneys of the copper refineries (area of Quintero, Ventanas refinery in Chile) (MARCHETTI, 90).

3.2.2.10. *Other heavy metals: Fluoride, Nickel, Cadmium and Mercury.* Fluoride has been found in water and soil associated to volcanic eruptions in Chile and Argentina, in the eruptions of the Hudson and Llaima volcanoes. Fluoride has experimentally demonstrated its capacity to develop cancer. Epidemiologic studies have demonstrated that Nickel inhalation has risen the incidence of lung cancers and nose and larynx cancers. Also beryllium, cadmium, chrome, cobalt, and nickel have demonstrated, under experimental conditions, the development in lung cancer. Epidemiologic studies have proved an increase in the incidence of lung cancer in workers who had been exposed to beryllium (MANCUSO, 70). Cadmium is associated to a higher incidence of prostate cancer (MALCOLM, 72). Chrome is associated to the increase of nose, larynx, breast and lung cancers in workers exposed to this metal (ENTERLINE, 74). The Mercury effects on health are polineuritis, nephrosis and cardiovascular symptoms. Gold mine workers who use mercury, are exposed to this metal vapours and develop symptoms associated to Hg. This problem has been found in the Amazon forest in Brazil, where between 100 and 300 tons of Hg a year are imported. (VEIGA, 90).

3.2.2.11. *Other suspension materials in the atmosphere.* There are different solid materials in the atmosphere, such as asbestos fibres, pollen, fungus spores, etc. Among them, pollen and asbestos have been associated with effects on health. In the high pollination season, in Spring, they have been associated to the presence of pollen. However, in the same season, secondary oxidants such as O<sub>3</sub> and NO<sub>2</sub>, which as demonstrated, are associated to bronchial asthma, also increase. It has

been demonstrated that asbestos is associated to the increase of lung cancer and mesotelioma. The exposed populations are public transport drivers, toll station workers, street hawkers, and transit policemen, due to the presence of asbestos in the brakes and clutches of vehicles.

3.2.2.12. *Pesticides, herbicides and fungicides.* These agricultural substances convey health effects on the nervous, reproductive, and immune systems and on the skin. Organophosphorate insecticides are associated to chronic neurologic effects of a motor kind, paraquat is also associated to alterations in movements and Parkinson disease. Workers contaminated with metil-bromide develop serious cerebral lesions. In addition, organophosphorates lead to a delayed polineuropathology (OPIDP) which is a syndrome which occurs between 10 and 21 days after a severe intoxication. Insecticides such as metamidofos are also associated with OPIDP, as well as merfos, mipafox, metamidofos, trichlorfon, trichlornate and perhaps fention (ECO, 93). Regarding the reproductive system, it has been demonstrated that a nematocide pesticide is associated to high infertility rates in banana plantations workers. That is why it was removed from the market. (ECO, 93) It has also been demonstrated that dibromoethilene (ADB) is associated to an increase in the number of abnormal sperm. Different studies have demonstrated, not conclusively, congenital malformations in exposed women's children (ECO, 93). The populations exposed to these substances are agricultural workers, and consumers of agricultural products which are contaminated with them.

3.2.2.13. *Solvents* These products used in industries are associated to hematologic alterations which include leukaemia and lymphomas (benzene); lung and nose cancer in people exposed to formaldehyde, male sterility in those exposed to ethers; kidney and liver lesions in those exposed to carbon tetrachloride and perchloro-ethylene; periferic neuropathology related to hexane and to MBK; chronic encephalopathy in those subject to a steady exposure to a great variety of organic solvents; and coronary ischaemia, psychosis and suicide in workers exposed to carbon bisulphite. In Brazil, 153 in 680 workers exposed to benzene suffered haematological alterations such as neutropenia. In Venezuela a study demonstrated a decreased ability in the test for establishing the central nervous system functions. In Chile there was a peripheric neuropathology epidemic associated to an overexposure to hexane in shoe-production workers (GARCÍA, 92). In Brazil a study in a petrochemical plant showed a higher incidence of lymphomas and plastic anaemia in workers exposed to benzene. When comparing them with regional rates, there was also an excess in mortality caused by leukaemia and plastic anaemia in exposed workers. (ECO, 93). The exposed population are the workers of petrochemical plants, those who work in industries which use cements (shoe production, plastic production, etc), furniture factories, leather factories and industries where fibreglass is used (ECO, 93).

3.3. *Implications of the polluting agents' combined action on health.* As it has already been said, the different polluting agents have unspecific actions on organs and tissues, the organic response to different polluting agents, being similar. What's more, some of them act in a synergetic way (particles and SO<sub>2</sub>), others act in an antagonistic way (increase in temperature and decrease in the polluting agents' concentration in basins with thermal inversion), that's why it is almost impossible to separate the action of each polluting agent from the others'. In a refinery, for example, the exposure to solvents is varied and difficult to individualize; agricultural workers are permanently exposed to multiple pesticides; in cities, people breath all the polluting agents and it is impossible to separate each action.

That is the reason why it is more feasible to join analysis and projections than do it individually in situations like atmospheric contamination, indoor contamination, and exposure to solvents.

#### 4. CONTEXT ANALYSIS (MACRO OR MEGA TRENDS)

As has already been said, we'll analyze each trend contextually from a general point of view, in each situation of contamination.

4.1. The macro trend regarding the heating of the atmosphere shows us that if there are no changes in the generation of gases of a greenhouse kind, heat will increase by 0.1°C each decade, which could convey the following effects:

a. An increase of vectors in large urban areas where they don't exist nowadays, like the case of the *Aedes egypti* which has the capacity of transmitting yellow fever and dengue. Mexico, Montevideo, Buenos Aires and Santiago would be at risk, because of the active interchange of people due to commercial and touristic reasons. The populations at risk would be 38 million people.

b. This temperature increase is also related to the increase of temperature in the Pacific Ocean, as a result of the El Niño Current. This current influences coast waters from California to the centre of Chile, with its highest effect in the coasts of the Pacific, Colombia, Perú and Chile. This situation, if the trend which started twenty years ago continued, would determine an increase in the temperature of coastal waters, influencing local sea life and bearing the possibility of keeping and reproducing *Vibrio cholerae* in plancton, because of its infection caused by the wastes of cities in the coasts of these four countries. The population at risk because of this macro-trend would be 78.5 million in the nineties and 92 million at the beginning of the new century without considering the secondary risk of the countries that the present epidemic has envolved because of having easy ways of contamination, such as Bolivia, Argentina, México, and Central America. This population at a secondary risk is 144 million in the nineties.

4.2. *Thinning of the Ozone layer.* As has already been shown in Paragraphs 2.4 and 3.1.3.b, this layer which protects from the ultraviolet radiation is getting thinner at a rythm of 2% to 4% decrease every ten years. In addition to that, every 1% decrease of this layer, ultraviolet radiation increases twice. We can therefore infer that if the present trend continues, this phenomenon's effects on health, such as skin cancers and cataracts, will increase between 4% and 8% in the next 10 years in the south of Chile and Argentine. If the phenomenon spreads to other countries such as Uruguay, Paraguay and Bolivia, an epidemic of both pathologies is predictable. Also, according to the most optimistic studies, the present trend will not only be steady, but also increase in the next ten years, and only by controlling the production and escape of the polluting agents which destroy O<sub>3</sub> in the atmosphere, would the phenomenon be stopped at the end of that period. This is based on the projection of the mean life of the carbon fluorides already emitted.

4.3. Atmospheric polluting agents. As has been stated in 3.3, it is almost impossible to separate the action of the atmospheric polluting agents on health and we can only separate Lead, when it is part of the atmospheric contamination. The study of the macro trend will be carried out by taking into account all the polluting agents together and separating the specific trends when it is possible. The first megatrend associated to atmospheric contamination is the progressive and accelerated urbanization in LA and the formation of Megalopolis, as was analyzed in 1.4, with an increase of urban population from 132 million in the nineties to 232 million by the year 2000. The other mega trend is that total suspended particles will increase over 300 µg/m<sup>3</sup> annual average, remembering that this equals 150 µg/dl inhalable particles. The World Bank's projections for low income countries (1.345 million) say that there will be at least 300.000 deaths associated to these particles. Using the same criteria we expect to have 29.000 deaths associated to these polluting agents, in the urban zones of LA today (132 million). A recent study on inhalable particles has associated a 1.1% increase in mortality to an increase of 10µg/m<sup>3</sup> of inhalable particles in three consecutive days in Santiago (Ostros, 95). This significant variation is maintained by controlling the minimum temperature and it is consistent in the daily variation, as well as the weekly, monthly and seasonal variation. This increase of mortality is found in mortality caused by respiratory and cardiovascular diseases, which is consistent with the findings in industrial countries. (Dockery & Pope, 94; Ostros, 93; Shwartz, 94)

Considering the symptoms in healthy population, if the experience of the Santiago study is applied, (Belmar, 89), controlling by nicotinism, indoor contamination and hyper-reactivity, under conditions of contamination like Santiago's, with high particles count, below the standard levels of NO and SO<sub>3</sub>, and high secondary oxidants (O<sub>3</sub> and NO<sub>2</sub>), there is an excesses of coughing of 25%, hoarseness, 12%, and nocturnal respiratory symptoms of 8.6%.

**Table 1**  
**Percentage of symptoms found in Santiago and The Andes mountains. Controlling for confounding variables**

PLACE	COUGH	HOARSENESS	NOCTURNAL RESPIRATORY SYMPTOMS
SANTIAGO	41,0	13,0	9,0
THE ANDES	16,0	1,0	0,4
% DIFFERENCE	25,0	12,0	8,6

Ref: Belmar, 93

If we apply these figures to populations in cities which have a level of contamination similar to Santiago, México, São Paulo or Rio, we can assume that if similar conditions are kept, the following irritative effects would be expected yearly in those cities with 48.9 million inhabitants: cough, 12.2 million people with irritative cough; hoarseness, 5.86 million people with irritative hoarseness; and nocturnal respiratory symptoms, 4.2 million people with these irritative symptoms.

In upper respiratory disease morbidity (rhinopharyngitis, pharyngitis, tracheitis, and unspecific disease of the upper airways), applying the information obtained in the Santiago study, if the same conditions of atmospheric contamination are kept, the excess of cases can be weighted in a projection, using the relative risks for each of those diseases identified in the study.(Belmar, 89)

**Table 2**  
**Cases, rates, relative risk and attributable risk in unspecific upper respiratory diseases.**  
**Rhinopharyngitis, pharyngitis, pharyngo-tracheitis, and upper airways diseases.**  
**Comparison between Santiago and the control city -Los Andes- 1988**

	Santiago		Control city		Risks	
	cases	rate (p.10.000)	cases	rate (p.10.000)	relative	attributable
Rinoph. cie #460	2.911	264	210	78	13,8	186
Pharyngitis cie #462	4.319	397	685	244	1,6	145
Tracheitis cie #464	943	85	83	30	2,7	55
Upper airways cie #464	6.005	546	641	238	2,3	308

Source: Study on atmospheric contamination in Santiago (ARA/SEECLA,89)

If we apply the relative risks to the populations of the three cities which have levels of contamination similar to Santiago, we could project the risks of the following disease excess cases affecting upper airways.

**Table 3**  
**Projection of excess cases/year, applying Santiago's attributable risks**

	Rhinophary	Pharyngitis	Tracheitis	Upper airways
Cities:				
-Mexico	372.000	372.000	110.000	616.000
-Rio	204.000	159.500	60.500	338.800
-São Paulo	342.240	266.800	101.200	566.720

Using the same methodology and projecting the excess bronchial asthma attacks for the three cities with similar contamination to Santiago, in the study previously mentioned, there was an attributable risk of 25 and a relative risk of 1.47 for age adjusted rates.

**Table 4**  
**Projection of excess cases/year of Bronchial Asthma,**  
**applying Santiago's attributable risk.**

Cities:	
-Mexico	50.000 excess bronchial asthma cases
-Rio	27.500 excess bronchial asthma cases
-São Paulo	46.000 excess bronchial asthma cases

In the epidemiologic study in Santiago, contamination was associated with pneumo pathologies. As in this case, it is difficult to project the role of atmospheric contamination on pneumonias, since the causal bacterial and viral agents are varied, so the following projection should be considered with the highest caution.. In the study, that was later ratified by another study in Brazil (Penna, 90), a possible association between atmospheric contamination and pneumonias was established for the first time. A specific regression study in one of the surgeries (Anibal Atiztia), was significantly associated to pneumonias, minimum temperature, inhalable particles, and secondary oxidants. (Belmar, 89). The relative risk for pneumonias was 2.77 for age adjusted rates and the attributable risk was 62 (ARA/SEEBLA,89).

**Table 5**  
**Projection of Pneumonia excess cases/year based on**  
**Santiago's attributable risk**

Cities:	
-Mexico	124.00 excess pneumonia cases
-Rio	68.200 excess pneumonia cases
-São Paulo	114.080 excess pneumonia cases

These projections, in spite of being only an attempt and presumably questionable, tell us that there will be thousands of deaths, Pneumo-pathologies, Bronchial Asthma accesses and upper airways diseases, which under any analysis, indicate social and human seriousness as well as a very high costs that society has to cover every year. In addition to that, we have only projected three cities, but if we projected for all the urban population of 200 million for the year 2000, the figures would be

even more worrying. If we take the World Bank study under consideration, we appreciate that there are countries where inhalable particles have diminished and high risk levels have decreased (PTS annual average of  $300\mu\text{g}/\text{m}^3$ ), so it's possible to revert the dangerous levels of atmospheric contamination where the 500 million inhabitants of LA live (WB, World Development Report, 92).

4.4. Contamination caused by Lead. Though we could call Pb an atmospheric polluting agent, it's possible to analyze it separately, as a macro tendency, because its generation is different and its control mechanism is easier to reach. We have already said that inhalable Pb gets into the organism through two main mechanisms; the adsorption of inhalable particles which behave as aerosols, and Pb direct ingestion with environmental dust (mainly in children). It comes from high octane gasoline or from paint remnants which contain Lead. Pb has been found in people's blood in an average level of  $5\mu\text{g}/\text{dl}$ , with a range from 3 to  $8\mu\text{g}/\text{dl}$ , and in exposed groups (car mechanics) the average is  $13\mu\text{g}/\text{dl}$ , with a range from 12 to 32 (ARA/SEECLA, 89). Taking these data into account, it's projected that at a high concentration in the air (occupational expositions) Pb levels in blood increase  $0.793\mu\text{g}/\text{dl}$  a year (ARA/SEECLA, 89). In Mexico city, for example, approximately 1,500 metric tons of Pb, which come from gasoline, are deposited in the city (Contreras, 90). As a result, Pb levels in blood of  $12.7\text{dl}/\mu\text{g}$  with a range between 3.4 and  $25\mu\text{g}/\text{dl}$  were detected in a sample of 90 children (Romieu, 92). In the same city, the adult female population was studied and levels reached an average of  $10\mu\text{g}/\text{dl}$  with a range between 1 to  $52\mu\text{g}/\text{dl}$ . Another study in Mexico city in children with high Pb levels ( $19\mu\text{g}/\text{dl}$ ) detected a significant decrease in their IQ associated with Pb levels in blood. (Muñoz, 93). It has also been demonstrated that when introducing gasoline without Pb, there's a decrease of the polluting agent in the atmosphere and in the population's blood levels. The actual macro-tendency is the maintained presence of Pb in the atmosphere. If the general averages from  $5\mu\text{g}/\text{dl}$  to  $12.5\mu\text{g}/\text{dl}$  and the actual exposures let us project an annual increase of  $0.793\mu\text{g}/\text{dl}$ , the groups which still have acceptable levels ( $0.5\mu\text{g}/\text{dl}$ ), will reach the epidemiological risk level of  $10\mu\text{g}/\text{dl}$  in a period of 12 years and a half; exposing half of the children population to have low IQ, and the adults to high arterial pressure. This is using the best possible scenario ( $5\mu\text{g}/\text{dl}$ ).

It's important to remember that at  $40\mu\text{g}/\text{dl}$  of Pb, haemopathologies appear and so do encephalopathies at  $50\mu\text{g}/\text{dl}$ .

4.5. Indoor pollution. As well as the outdoor air is seriously polluted by breathable particles, secondary oxidants,  $\text{SO}_2$ , CO and Pb, the air in the rooms is also polluted by the smoking habit, domestic fuels, dust in the houses, and construction materials (asbestos, radon, spores, domestic insecticides). Studies have established that "social smoking" habit (when non smokers inhale smoke) increases 14% the risk of serious obstructive

Bronchitis (SBO) , 18% in the working place (Euler, 86) and it also increases the risk of Lung Cancer. A study in Santiago has demonstrated that coal and firewood increase 39% the risk of Pneumonia and 67% the risk of Bronchial Asthma in the general population, (ARA/SEECLA, 89) and kerosene increases the Obstructive Bronchial Syndrome by 33%(ARA/SEECLA, 89). It's known that 42% of the rural population use charcoal or firewood as domestic fuels; in urban environment 7% coal or firewood, 36% kerosene (ARA/SEECLA, 89). Summarizing, reality in Chile, which is one of the more urban countries in LA, says that half of the rural population uses fuels posing risk and two thirds of the rural population have these risks, it's predictable that the situation in the rest of LA is even worse. This explains the serious incidence of respiratory diseases in the rural area and makes it- together with the enteric ones- the highest morbidity in LA. This steady tendency means that 186 million people in the urban areas and 85 million in the rural ones are seriously exposed to the polluting agents contained in domestic fuels.

Social smoking, whose risk in the non smoker population is recognized by an epidemiological study (Belmar, 93) in a rank between 28% and 45%, is another indoor factor, as well as the working places. The non-smoker population in LA reaches 440 million from which 61 million are under risk due to the effects of being exposed to tobacco smoke. The tendency risks tend to increase considerably since the tobacco market tendency is to open the groups of recognized non smokers, such as women and adolescents.

4.6. Labor Risks. Many of the polluting agents which have been studied exist in the labor environment with higher exposures (comparing with the general population) to pesticides, solvents, and heavy metals. Although general information is scattered and studies don't have general population frames to consider the subjects in the framework of macro tendencies, we'll analyze them in each one of the three groups.

4.6.1. Pesticides, Herbicides and Fungicides. The efficient agricultural industry and the exporting pattern prevailing in LA, has exposed large groups of workers to these risks, and even worsened them since LA is the dumping zone of these compounds which are not allowed in other developed cities (the sale of 30% of the pesticides used in LA isn't allowed in the USA market, Navarro, 84). In a sample of nine countries, with 294 million inhabitants, it was demonstrated that 144.8 kilograms of pesticides were used in agriculture, which gives an average of 3 kilograms of pesticides per worker, with a range between 1.7 klgms to 14 kilograms (Heno, 93); in addition to that, there were 27 million kilograms devoted to other uses in those countries. This situation is increasing in LA, showing a higher risk tendency in agricultural workers since the use of pesticides has increased 40% in the period from 1988 to 1993, and growing steadily (from 1983 to 1988 there was a 45% increase in their use), whereas its use in the rest of the world reaches only 20% (ECO, 93).

As it was already demonstrated in paragraph 3.2.2.12, the population in LA has demonstrated severe health damage caused by these compounds effects.

4.6.2. Solvents. Latin America is an important solvent producer, representing 6% of the world market, producing 8.4 millions of metric tons in 1990, and projecting a production of 12.3 million metric tons for 1995 (ECO, 93). This rising tendency lets us determine a tendency of higher exposure of agriculture workers as well as in the whole population, with its subsequent health risks identified in 3.2.2.13. (ECO, 93).

4.6.3. Heavy metals. Pb was already analyzed in relation to the atmosphere. The other polluting agent is Arsenic, mainly when it contaminates drinking water like in the case of Chile between 1955 and 1970, with a concentration of 0.398 mg/l in a population of 265 thousand people (ECO, 93). This lets us establish some incidence rates for chronic arsenism as chronic arsenical dermatosis of 20 every 100,000 and cancer risks with the following levels: bladder cancer RR 20; kidney cancer RR 5.7 and liver cancer RR 6.5; there's also an increase of coronary ischemia risk of RR1.9 (Sandoval, 87; Rivara, 92). That's why the tendency to keep risk levels of arsenic in drinking water for the general population determines an important increase of diseases and cancers (ECO, 93). One of the fundamental pillars in the exporting market pattern is "development first" and in Chile particularly copper exportation; copper mining is recognized as a risk factor when rewashing it, since it puts a risk on the underground layers as well as water streams on the surface which can serve the urban groups as drinking water. It's convenient to observe carefully the final destination of these rewashing waters in all mining projects in order to prevent these phenomena.

Other heavy metals have already been analyzed from the human health point of view and the health risks correspond to the labor groups and communities which are near the productive processes.

4.7. Biologic Pollution of water. The seriousness of this problem is and has been a serious factor for human health in LA, leading the morbidity and even as an important cause of death. Though the healthy drinking water percentage has increased, this has been counteracted by not treating sewage waters. Only 2% of sewers are treated in LA, which maintains enteric diseases and it is even worsening with the cholera epidemic. There's some negligence from authorities and society in general regarding the efficient use of healthy water. The World Bank has communicated that in LA there's an important loss of healthy water, it has also remarked that an improvement in the sewage system can reduce the diarrhoea prevalence by 22% and 60% its mortality. (BM World Development Report, 92).

4.8. Summarizing, the present information demonstrates some tendencies which are harmful to man's health such as the heating of the atmosphere, the increase of ultraviolet radiation caused by the thinning

of the ozone layer, drinking water biologic pollution, atmospheric pollution in the urban settings, soil and air contamination caused by Pb, indoor contamination by the effects of tobacco, domestic fuels, pesticides in rural areas, and solvents and heavy metals in the labor environment. The general tendency consists in increasing the risks and, in some cases, maintaining them without having found -in any of these areas- a way to slow them down and reduce people's risks as a result of international, national or local policies. On the contrary, the clear tendencies identified in this study which are making the health scenarios change, such as the demographic and epidemiological transition, the increase of poverty, the changes in the way of life, and the new economic pattern, are increasing the contamination risks which have already been defined in LA.

4.8.1. The epidemiological and demographic transition is determining a higher number of economically active population which is exposed to the different polluting agents already identified. Also, the accelerated urbanization and growth of the cities are increasing the atmospheric contamination processes caused by public transport and cars overuse in the extensive urban areas of LA, where 75% of the population live. (ECO, 93).

4.8.2. The steady and even growing number of poor determines the prevalent use of firewood as a domestic fuel with the risks of increasing Pneumonias and Obstructive Bronchitis in the inhabitants of those homes and the development of lung cancer caused by pyrolytic acid emanation from those fuels. In addition to that, this contributes to the deforestation and desertification processes of the continent. The low levels of education, which the state's incapacity has generated in those groups, prevents them from having access to the information concerning contamination risks, and the specific mechanisms to protect the individual in his work place, the family at home, and communities in their environment.

4.8.3. Life styles are also increasing the presence of contaminants. As it was said before, the gradual incorporation of the smoking habit in women and youngsters, the tendency of living in the urban environment, is reducing the arable lands and rain absorption lands with the consequent destruction of the vegetation layer as a result of the avenues and floods. The excessive car overuse determines the emission of CO tons, SO<sub>2</sub> particles, nitrogen derivatives and Lead which are the main cause of atmospheric contamination in human concentrations in LA.

4.8.4. The Free Market Exporting Pattern has increased human interaction with its environment in Latin America, which not necessarily means an antinomy between productivity and environmental damage. However, the overexploitation of forests and seas; the production of products which damage the environment such as the export of chips and fish flour; the contamination of the agricultural environment with pesticides; and the contamination of air, water, and soils in mining

processes with SO<sub>2</sub>, Mercury and Arsenic, send an alarm sign to LA, regarding the development of an uncontrolled destructive and what's more important inhumanized productive pattern. The way the free market pattern is applied is inhumanized because it has been proved that differences between income quintiles have increased and what's even worse, the poor and the medium sectors have decreased their real incomes. (CASEN survey, Chile, 95)

## 5. ELABORATION OF POSSIBLE SCENARIOS

The tendencies of environmental decay in Latin America are increasing or in just a few cases are maintaining their levels, reaching, in both cases unacceptable levels for people's health as well as to guarantee a sustainable development. That makes it difficult to establish other scenarios which don't lead to worsening the damage, which is not feasible either since the actual damage levels are so high that its effects on health are hard to worsen. The problem consists on the fact that since research is limited, there is no public concern due to the lack of access to other countries' information and to the fact that there is no information in LA. We wonder, if a study in Latin America has associated that an increase of 10 µg /m<sup>3</sup> for three consecutive days, increases general mortality by 1.1%...How many times could this have happened in a city in L A? Existing data let us project the damages of atmospheric contamination on health in the population of only four cities where exposure levels are approximately known. We wonder if we are considering 356,200 cases in excess of Pneumo pathologies in a population of 53,9 million people in only four cities (Santiago, Rio, São Paulo, and Mexico), what happens with the other 81 million people who live in cities with similar deteriorated air conditions, and with the 365 million Latin Americans who live in minor cities and in the rural areas. If it were so, *we could project more than 33,00.000 Pneumonia cases in excess a year, which would mean that 33 million work days would be lost (affected people or people who look after the affected) and a projection of health expenses of at least \$500,000,000 dollars a year.*

However, the fascinating thing when dealing with health is that according to the natural history of disease (Leavel & Clark, 48) there are progressive levels of action which go from the strenghtening individual, to health maintenance, specific prevention, early detection, early diagnosis and treatment, rehabilitation, and up to the ill person's social insertion (Belmar, 95). That's why in those cases where, due to the fact of political will or resources to avoid, maintain or even prevent contamination, at least we can still detect in advance, to avoid invalidity and death. That is to say that even in the most ill-fated circumstances, the health team can find a health level to adjust the patient's potentialities to his biologic and social needs.(Belmar, 95).

The scenarios we shall discuss next, are based on assumptions which mean renewed policies regarding the environment, a greater and better knowledge of the causes and effects of this environmental harm, and in people who get engaged with the concept of sustainable development for LA.

5.1. The heating of atmosphere and seas. This progressive heating can only be controlled by the decrease in the production of gases of the greenhouse effect, particularly CO<sub>2</sub> which is the final result of industrial combustions, the use of vehicles, and the burning of forests and pastures. For that it is necessary to:

a. Look for non contaminating energy sources at industrial, transport and domestic levels. At an industrial level, the clean generation of electricity is the basic premise. This item is difficult to be taken up from the health sphere, and it is up to the decision makers to understand and implement this task. A situation like this is applicable to the transport energy. It is with reference to domestic fuels, that the health sector can contribute. A real alternative is to replace firewood, coal, and even kerosene with clean procedures such as the heaters of agricultural wastes (husk, waste pulp and wood dust) with a double chamber which do not generate polluting agents either in the house or outside.

b. To eliminate the burning of pastures and stubble as a part of agricultural production, where primary schools in agricultural communities can be a positive factor.

c. To limit the excessive use of motor vehicles, promoting personal exercise, which also corresponds to the primary care teams as well as the physicians in general.

Even though very little can be done from the health sphere to diminish the production of these gases, an area of this sector is the one which must study the health risks the phenomenon carries with it. The new habitat which is generated by the increase of temperature should be studied to eliminate or control vectors as the Aedes and Anopheles mosquitoes. The same happens with parasitic diseases that develop part of their cycle on the ground and depend on temperature and humidity such as the uncinariasis, ascaridiasis and eschistosomiasis.

5.2. The Increase of ultraviolet radiation. The thinning of the ozone layer is a phenomenon, as previously said, that will go on increasing in the next ten years. However, the drop of fluorocarbon emissions to the air, let us keep the hope of the decrease in the damage in the environment to the next century. The health sector's task is to try to educate the exposed population to diminish their exposure levels by:

a. Decreasing the exposure time or protecting the skin with solar blocking protection over 20 UVA/UVB.

b. Using glasses which protect from radiation, particularly in children.

c. Educating the population to eliminate the use of fluorocarbon gases and their free emission. This is a task which can be done by primary care teams and physicians in general.

Blocking this radiation will allow the prevention of the increase in the percentage of melanomas and cataracts in a proportion of two to one .

5.3. Atmospheric contamination in the four cities which were studied (Santiago, Rio, São Paulo, and Mexico) could produce: 29,000 possible deaths according to a World Bank's projection where mortality data was associated to particles ; and regarding a projection of the Epidemiological Study in Santiago, 3,706,000 excess cases of diseases of the Respiratory System (rhinopharyngitis, pharyngitis, tracheitis and non-specific diseases on the upper airway) 163,000 excess cases of bronchial asthma attacks and 356,000 Pneumo pathologies excess cases. The World Bank studies establish that if the levels of inhalable particles can be lowered to the acceptable standard, less than the average of  $300\mu\text{g}/\text{m}^3$  of TSP a year ( $150\mu\text{g}/\text{m}^3$  of PM10), a great part of deaths could be reverted and morbidity could be lowered to a half. It's remarkable that only inhalable particles are clearly associated with an increase of mortality, as in the study which states that a daily increase during three days of  $10\mu\text{g}/\text{m}^3$  of PM10 is associated to a 1,1% mortality increase (Ostros, 95). Studies in industrial countries arrive to similar conclusions in London, Philadelphia, Ohio, Detroit, Alabama and California (Dockery and Pope,94; Ostros, 93; Shwartz, 94).

In spite of that, even if contamination levels aren't radically changed, education can be offered to decrease the exposition and early detect the damages in order to prevent invalidity and death. Based on the epidemiological research in Santiago and on the clinical experiences on the handling of bronchial obstruction in the primary care field in Chile, an intervention called "Abbreviated Hospitalization" has been developed in urban surgeries in Chile (Girardi, Astudillo, Aranda, Mancilla, and Belmar,95) (see description in annex). This procedure has contributed significantly to the decrease of infant mortality caused by pneumopathologies, and has avoided obstructive damage in children in Santiago, apart from saving 10 million dollars of hospitalization and unnecessary medicines (Astidillo and Mancilla, 94).

**Table 6**  
**Differences between the projected and real rates of late infant mortality caused by Pneumonia. Chile 1990- 1994**

Year	Projected	Rates per 1000 born		Cases
		Real	Difference	
1982	2,61	2,36		
1989	2,30	2,00		
1990	2,26	1,91	0,35	107
1991	2,22	1,62	0,60	180
1992	2,18	1,62	0,56	164
1993	2,14	1,61	0,53	154
1994	2,10	1,27	0,83	239
Total N° of cases				844

Source: Aranda, 95.

This table shows us that once the association Pneumonia-contamination had been found in 1989, the decrease of mortality began. When "Abbreviated Hospitalization" is implemented in 1990 the tendency to fall starts. When the "abbreviated hospitalization" room was implemented in most urban surgeries, providing them with physiotherapists for respiratory kinesiotherapy and preparing the primary care team to educate, evaluate and treat respiratory pathologies, achievements surpass the tendency. It culminates with a decrease of infant Pneumonia as previously mentioned, of infant Pneumonia from 2.36 per 1000 live born to 1.27 per 1000 live born, which means a decrease of 53.8% (Aranda, 95).

Although the data on contamination caused by SO<sub>2</sub> shows us that this polluting agent is at a risk level in just a few cases, Mexico and São Paulo, it is important to alert that the acute episodes with deaths which were demonstrated to be associated to contamination, always had two necessary components: the increase of inhalable particles and SO<sub>2</sub>. That's why wherever there is scenario including the risk of increasing SO<sub>2</sub> over the 24 hour average of 150 µg/m<sup>3</sup> (already existing TSP levels of more than 300µg/m<sup>3</sup> in many cities and in every city where the TSP was measured, it surpassed the 150 µg/m<sup>3</sup>) (Romieu, 90)- the repetition of a phenomenon such as London 1950 should be considered .

It is also important to mention that contamination is not only associated with cold weather (autumn/ winter), but it also appears in other seasons due to the development of secondary oxidants which are associated to the light and the increase of Nitrogen. That's why any increase of NO<sub>x</sub> levels means risk and so we call the attention to the massive use of natural gas as a preferred energetic element in cities. The

risks are: the increase of secondary oxidants associated to Obstructive Bronchial Syndrome and Pneumopathologies.

Another scenario to consider is the permanent exposure to hydrocarbons' derivatives, particularly to the aromatic polycyclic ones, such as benzopirenes (Prendez, 93) which was a demonstrated cancerogenic substance (Gil, 92, Gil, 91). That's why, in cities with high levels of contamination caused by hydrocarbons such as Santiago, São Paulo, Cubatao, and Mexico, an epidemic of Broncogenic cancers is quite likely within ten years' time, considering the latent period of the cancerogenic substances' action.

Another scenario, is the accumulation of people and specially children with chronic obstruction since many of them have surpassed the 700 hours/year (Euler, 89) under exposure to atmospheric polluting agents in the cities where contamination is higher (Mexico, Santiago, and São Paulo). There are people with chronic obstruction in Santiago who are the first in reacting to contamination levels. These don't provoke obstruction in the healthy population.

5.4. The effects and the population's high exposure to Pb, specially within the group of workers who are exposed to this heavy metal (drivers, mechanics, policemen, street hawkers, etc.) has widely been analyzed. If measures to prevent the risk of an annual Pb increase of  $0.793 \mu\text{g}/\text{dl}$  in blood demonstrated in the Santiago study (ARA/SEEBLA, 89) are not taken, most urban populations in LA will reach the epidemiological threshold of  $10 \mu\text{g}/\text{dl}$  of Pb in the blood in only ten years' time. Measures such as the change of leaded gasoline for gasoline without this polluting agent, should be considered.

5.5. Indoor contamination. Risks provoked by nicotinism and domestic fuels generate conditions of respiratory damage which unless confronted, they will join the harm caused by atmospheric contamination. These scenarios could be modified by the introduction of technologies which eliminate or slow down indoor polluting agents to a maximum level. These technologies are:

- Education for youngsters and women to prevent nicotinism.
- Control and limitation of publicity that increases nicotinism in those groups.
- Development and population's wide access (especially in those with low incomes) to the use of domestic fuels without risks for the house and atmosphere, such as heaters or cookers with double combustion chambers.

5.6. Pesticides. These polluting agents' situation, health risks and population, have already been mentioned in the previous items (3.1.5.d ; 3.2.2.12; and 4.6.1.). There is no doubt that the agricultural products exporting pattern as well as the technification of agriculture and silviculture predict an increase of 40% of the actual growth of these possible polluting agents. In addition to that, the exposure of people in

general means an increasing risk, by the presence of polluting agents of agriculture in food. The education for those who work (executives as well as workers) both in agriculture and sylviculture is fundamental to know the health risks of these compounds. Moreover, the improvement of the public sector's regulating role on health and environment is to be expected if we consider the data which say that 30% of the products which are being sold in LA are undesirable.

5.7. Labor Risks. As was remarked in the previous paragraphs (3.1.6.d, 3.2.2.13 and 4.62) solvents have an outstanding position among health risks. Just like in the case of pesticides, the education of those exposed as well as the executives' and the regulatory role of the State, are factors that could change the growing tendency regarding this kind of risk.

5.8. Water and sewage. The problem of large sectors of people without healthy water, specially in the rural areas and in urban marginal areas, as well as the lack of treatment in sewage water - only 2% of it is being treated in LA- pose a severe risk to health in LA, with a sequelae of thousands of deaths, cases, loss of labor days and invalidity which mean a great loss ( millions) in the social and economic potential of LA. According to the World Bank's projections, out of the 900 million of diarrhoea cases, 83,000,000 of enteric ones and 83,000,000 cases of enteroparasitosis, would correspond to LA. With the same projections, a decrease of 22% of the diarrhoea cases and 28% of the enteroparasitosis would be possible if larger groups of population had access to healthy water and basic sewage systems. This information shows us the need of assigning priority to water and sewage systems in LA, even considering it more important than the other polluting agents under study since technology for these measures is available and it is only a matter of political decision by the states. It would be very interesting if each country applied the World Bank's projective models and saw the preventable deaths and cases by just making the right decision to give the population access to water and sewage systems. It would be enough to use the contributions made through taxes, by these people who would survive, to demonstrate that they would self-pay the investment in their lives.

## 6. RESEARCH QUESTIONS AND CHALLENGES

Questions and challenges that emerge from the problems related to the serious and growing damage for the region, must be answered in a context, not only by weighing this damage, but also by looking for ways of intervention which limit or revert this damage and its effects on human health. To make this analysis easier, questions and challenges would be applied in each one of the areas under study.

6.1. *The heating of the atmosphere and seas.* As it has already been

mentioned, from a health point of view, the appearance of new vectors caused by ecological changes is very important in Mexico, Argentina, Chile and Uruguay. The study should be directed into habitat, domestic infestation, and factors which control the propagation of *Aedes egypti*, *Anopheles punctipennis*, *Triatomas infestans* and *redubidius* and *Triatomas spinolais*.

The situation of plancton's infection with *Vibrio cholerae* should also be studied.

In addition to that, the incorporation of dengue, yellow fever, malaria, and Chagas disease to the epidemiological surveillance mechanisms should be studied to control their situation and establish the presence of "native cases" in non endemic areas of these pathologies.

Another area of research are the parasites which develop part of their cycles in the environment since variations on temperature would alter those cycles. Such is the case of:

- *Ascaris lumbricoides*, which needs humidity and high temperatures to complete its cycle and produce the infectious eggs.

- *Necator americanus* and *Ankylostoma duodenale*, which also need a wet environment with higher temperatures to develop the infectious larva.

Another area of development is to study or determine epidemiological surveillance systems in the area of 16<sup>a</sup> C isotherms, which is the limit point of development for vectors and parasites with cycles in the environment. Among these parasites we could find the *Schistosoma hematobium*, since it was said that when there was a climatic change as a result of the Asuan dam in Egypt, the appearance of this parasitosis was observed in areas where it wasn't endemic.

6.2. *Increase of ultraviolet radiation.*(UV). The result of the thinning of the ozone layer is causing an increase in the ultraviolet radiation of 2% every 1% of this layer's loss. Therefore, the questions that arise regarding the health field, lead us to weigh the impact of this ultraviolet radiation on tissues which respond negatively to it such as the skin, the eye, and the immune system. Chile and Argentina should concentrate on these studies, determining the populations under high risk, the times of highest exposure and the aggravating factors of the exposure to this kind of radiation. Apart from that, they should search for open air-lifestyles to slow down the exposure, specially in children that will have a higher risk since they'll be exposed longer.

Chile and Argentina should intervene together to generate educational policies to limit the pupils' exposure to UV in the south, limiting or developing the sport activities indoors.

Population in general should be educated in the same way to wear UV protection glasses to prevent cataracts.

Studies focused on the UV effects on the immune system (both general and local immunity) should be promoted.

6.3. *Atmospheric contamination.* The risks of the atmospheric polluting agents on health, have been projected in the corresponding sections. The multiple questions which emerge from the studies in LA and from the general information are the following:

-Though the studies in LA are just a few, general information determines that inhalable particles are associated to respiratory irritation, bronchial obstruction and Pneumopathologies. Among these effects, the pathophysiologic base of this deleterious action in the association in Pneumopathologies has not been elucidated and it is important to know this pathologic processes. The reason of the synergetic action with SO<sub>2</sub> is also unknown. In addition to that, the presence of both polluting agents, PM10 and SO<sub>3</sub>, has been found in all the episodes with a high mortality rate caused by atmospheric contamination. This situation should be accounted for pathogenically.

Another aspect where research should focus is the reason for the latent period of three days to determine the association between general mortality and the steady increase of particles of 10µg/m<sup>3</sup>.

The surface adsorption of inhalable particles is another phenomenon which deserves more research, since it is the mechanism which allows heavy metals to get into the bloodstream.

- The action of secondary oxidants (such as O<sub>3</sub>, NO<sub>2</sub>, and sulfur oxidized derivatives which are increasing in the places where they have been measured) should be studied as well as their possible association with pneumopathologies, association which has not been substantiated yet.

-The accumulation of obstructive harm caused by long-term exposures to particles and polluting gases and which has been observed in California, is a field of study in cities with long-term exposures to polluting agents such as Santiago, Mexico, São Paulo, Bogotá, Buenos Aires, and Rio.

Apart from these questions focused on generating knowledge, it is the countries' responsibility to study the situation and the effects of pollution in their cities. It's advisable to carry out an epidemiological study which has both the ecological epidemiological research model, and the exposure degree model, like the Santiago epidemiological study.

Apart from the questions regarding aspects of respiratory diseases, it is necessary to define the health effects in cardiovascular diseases, particularly in affections of the ischemic coronary kind associated to CO, as well as hypertension and its relation with Lead.

Other polluting agents such as aldehydes bring up a kind of contamination whose effects on human health also deserve being defined. Ethanol and gases derived from natural gas combustion (energetics in development in LA) are contaminants whose effects on health also deserve more accurate knowledge.

6.4. *Indoor contamination.* It is important to have a more precise

knowledge of the polluting agents and their effects on health since people spend more than half of the day at home. The study areas could be the following:

- The penetration of atmospheric contamination in the house, the spread of polluting agents in the different rooms and insulation of areas where contaminants are emitted (kitchen).

- Research on domestic fuels, specially firewood, regarding the kind of polluting agents it emits and their relationship with the type of cooker or heater.

- Radon and other contaminants in the house and their effects on health.

- Liquid gas and its possible contaminants, since it is the most widely used fuel, and that trend is increasing.

- Morbidity and mortality associated to indoor polluting agents.

6.5. *Pesticides and similar.* The areas which deserve research are:

- To know more accurately the real intoxication rates caused by pesticides since the present information is limited. To study a national epidemiological surveillance system which should be inter-regionally coordinated to control and measure these intoxications, particularly the ones caused by pesticides which are forbidden in other countries and are used in LA. (ECO, 93).

- To study and validate the development of "biological markers". For example to validate etilen-thiourea as a marker in those exposed to EBDC, to weigh its teratogenic, cancerogenic and neurologic effects. To standardize the cholinesterase test in people exposed to organophosphorates (ECO,93).

- To develop cohort studies of people chronically exposed to pesticides to know the chronic effects of different pesticides.

6.6. *Solvents.* The items to be studied and deeply analyzed in LA are the following:

- To study the reproductory risks of specific solvents in exposed populations.

- Cohort studies in industrial workers who permanently use solvents such as glue, and paint factories and refineries (ECO, 93)

- To study the chronic, biological, and psychological effects of solvents when used as narcotics (inhaling cements).

- To apply the concept "centinel events in occupational health" to studies. Diseases as well as disabilities have appeared in the labor environment: silico-tuberculosis, brucelosis, tetanus, hepatitis A, leptospirosis, nasopharyngeal cancer, mesothelioma, bone cancer, acute leukemia, aplastic anemia, toxic encephalitis, ataxia, cataracts, tinitus, renal failure, male infertility, are all suggestive pathologies.(ECO, 93).

6.7. *Water pollution.* Drainage and healthy water areas, have been intensively analyzed in LA. However, the severe environmental changes define new research challenges such as:

- The progressive shortage of fresh water sets the need of studying the age of the water in usage when this water is not renewable, and what's more, if it is going to be used in mining tasks under the risk of being contaminated by heavy metals.

-To establish a cohort study for the exposure of people who drink contaminated water containing heavy metals such as As, Cr, Fl and others.

- To study the process of salinization of water and look for mechanisms to prevent the harm to this unreplaceable natural resource.

## 7. MAIN RECOMMENDATIONS

This analysis leads us to conclude that the process of the environmental decay in LA is serious and does not show a desacceleration trend either in environmental harm or in people's health. On the contrary, we are on what we could call the worst scenario in almost all the polluting agents. We can't either say that the protection of the environment and the one concerning the effects on people's health, is considered a central preoccupation by governments.

Research regarding the polluting agent's effects on health is very little and limited to academic studies which don't have a "denominator" direction, being difficult to project the findings to a given population. Only in three cities there are population epidemiological studies regarding the effects of the polluting agents on human health. The situation of the indiscriminate use of pesticides, herbicides and fungicides, is serious and a third of them have been forbidden in other cities.

There are no government policies to promote research to measure the pollution risk on their populations. Universities keep an academic interest on this kind of research, and clinical as well as hospital research are given priority over epidemiological research of population projection. The resources destined to research on environmental decay are so meager, that they can't afford any prospective study, but only small case-studies.

These preceding reasons, allow us to state the following recommendations:

-To recognize the governments' need for assuming the serious and progressive decay of the environment and the serious effects of pollution on people and particularly workers.

- To set an action of social communication, which within the framework of the concept of sustainable development, entirely shares the present and serious decay of the environment and its impacts on Latin Americans' health, with the population, stating that everyone without exception is responsible for this progressive harm and so all of us must contribute to stop this situation, which will change our societies unless positive actions to protect the environment are done.

- Though it emerges from the previous recommendation, it is important to identify the need for an educational reform to educate all the children and youngsters on the principles of sustainable development, the protection of the environment and human health and the defense of the species.

- To bring together all financing sources - governmental as well as private - which act in each region in LA, to share this study's information and recommendations, in order to generate a research policy to know and quantify the harm in people's health and establish jointly the action of social communication which was previously recommended.

- To distribute this study in all the libraries in LA and generate discussion seminars in each country to deepen the analysis on the decay of the environment and its harm on human health. To culminate this process in the universities or academic institutions with a regional meeting of all the researchers in the field, to start a process of mutual support in research which emerge from this process and guide the sources of financing and technical support towards this process of scientific research.

-PAHO's Human ecology and Health Center -ECO- would be invited to establish a coordination mechanism to support and encourage researchers on the environment and health subject, apart from continuing the process of social communication which would be encouraged according to the respective recommendation.

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This book represents an effort to determine an agenda in collective health research for the Latin American region for the coming 15 years.

The need for such an agenda is based on the scarcity of collective (or public) health research when compared to other branches of research in the health area, and on the fact that the demographic and epidemiological situation, as well as the structure of health systems, change rapidly, without an equally fast pace in the advance of knowledge on those changes.

It is meant to be useful for decision-making in the area of health research policies, both for national and international agencies.

The methodology used for priority setting was based on the identification of social trends through consensus techniques, in order to further identify their consequences on health and health systems, and the gaps of knowledge for responding to them. Health is stressed therefore, as a social phenomenon, conditioned by and conditioning its environment.

The group of experts who participated includes some of the most outstanding public health people in the region, coming from different countries and with diverse field of work.

Given the composition of the group, and the regional scope of the exercise, one could expect a great degree of generalization in the conclusions, but that is not so, since all subjects discussed are of outmost relevance to the whole of the Latin American countries and they are dealt with in depth.

The convening institutions were Canada's International Development Research Centre (IDRC), which not only financed the project, but directly participated in the task, and the Study Group on Economics, Organization and Social Policies (GEOPS), in Uruguay, an NGO dedicated to research on social subjects, mainly health, education and labor, which coordinated the project.