Final Report to IDRC

“Understanding the Demographic and Health Transitions in Developing Countries using Health, Health System and Demographic Surveillance Data”

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Submitted by

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Submitted on behalf of scientists from the four participating centres
Executive Summary

The transitions provided examined the demographic and health transition in Africa and Asia using health and demographic surveillance data from four INDEPTH member centres – two centres in Africa (Agincourt and Navrongo HDSSs in South Africa and Ghana respectively) and two from Asia (Matlab and Filabavi HDSSs in Bangladesh and Vietnam respectively).

The expected outcomes of the projects was to examine long-trends in fertility, mortality and patterns of disease burdens over time in order to document the health and demographic transitions to determine the nature and pattern of the transitions occurring in these countries.

Over the past two years the team has worked assiduously on the project. The first year of the project focused on data preparation, cleaning and preliminary analyses. This was done through a series of workshops that brought together the co-PIs from the four centres, as well as the INDEPTH PI and other scientific staff from the INDEPTH secretariat to jointly carry out the exercises.

Results from the analyses of data from the four centres clearly demonstrate that data from INDEPTH centres represent unique opportunity for studying the demographic and health transitions in low-and-middle income countries. Analyses of trends in fertility, mortality and causes of death data show clear transitions in both fertility and mortality. Rapid declines have been witnessed in both fertility and mortality in three of four centres – Matlab, Navrongo and Filabavi. On the other hand, Agincourt has witnessed an increase in mortality over the last ten years, owing mainly to the impact of the HIV/AIDS pandemic witnessed in Southern Africa. There has also been an increased in noncommunicable diseases, even in the face of persistent communicable diseases. For instance, the results from Navrongo show that while mortality is still primarily driven by communicable diseases, there is a sharp increase in noncommunicable diseases and injuries.
Introduction
This is the final report on the demographic and health transitions project funded by IDRC. The demographic and health transitions project was awarded to INDEPTH in June 2009 and involves four INDEPTH member centres – two African centres (Agincourt in South Africa and Navrongo in Ghana) and two Asian centres (Matlab in Bangladesh and Filabavi in Vietnam).

The general objective of the project was to utilise the unique longitudinal surveillance data produced by INDEPTH member centres to document changes in population and health in developing countries characterized as the demographic and epidemiological transition. As a pilot, IDRC provided funding to undertake this work using data from four INDEPTH centres – Agincourt and Navrongo from Africa and Matlab and Filabavi from Asia.

These centres were selected based on a number of criteria, the most important one being how far back in time the centre has been in existence, the type of data collected and geography (in terms of Africa and Asia). All four centres have been collecting data on fertility and mortality, including causes of death data, for at least 10 years. In addition, all four centres were also involved in a special study on adult health and aging thus making them ideal candidates for the project.

The study on adult health and aging collected comprehensive information on health and well-being of adult and older populations, including questions related to physical activity and cognitive functioning and in two of the centres information on anthropometric measures and biomarkers. This information is being used to undertake a systematic analysis of the shifts in health and demographic patterns in Africa and Asia.

The specific objectives of the project were to:
1. Explore demographic and health transitions at selected INDEPTH centres
2. Document changes in health and demographic transitions using data from the participating centres.
3. Compare transitions between the African and Asian centres and also between different sub-regions in Africa.
4. Compare the experience in the developing country-settings to what happened in the developed countries at the time of their transition.

5. To examine the implications of the transitions on the health care systems (to consider the possible cost implications: infrastructure – human and physical; health financing; education awareness and promotion implications)

The key outcome of this project is mainly to contribute to an understanding of the demographic and health transition in Africa and Asia. In this report we present information on the implementation of the project and some of the key findings that we observed. Ultimately, we expect to publish two key peer-reviewed journal articles from the project combining data from the four centres. We expect that each centre will also publish articles from their centre-specific analyses based on the work from the project.

**Implementation of the project**

Following the approval of the grant by IDRC on June 22, 2009, the INDEPTH Secretariat immediately called a meeting which took place from September 17-18, 2009, to discuss implementation strategies, agree on data needs and analysis plans, as well as start preparing analytical files. All participating centres were requested to come along with as much data as could be marshalled. The meeting was attended by one scientist per centre, except for Navrongo centre that had two persons.

This maiden meeting focused on implementation strategies, as well as producing a framework for analysing the data, and how the work was going to be executed. A general outline was produced for pool-analyses as well as centre-specific ones. It was agreed that each centre should do separate analysis in addition to a joint analysis by pooling the data from all four centres.

It is important to note that throughout the two years period of the project several analytical meetings and workshops were held culminating in the production of the results that we present here. It is significant to note also that through this project INDEPTH has been able to strengthen the capacities of scientists on the analyses of longitudinal data utilizing state-of-the-art analytical methodologies. As part of the
implementation process INDEPTH organized two major workshops on Event History Analyses for scientists from more than twenty of its member centres.

The major reason for leveraging the funding from the transitions project to strengthen capacities of more scientists from the network is that we anticipate seeking for more funding to extend this important piece of work to cover more centres from the network. Through this work we have now created the necessary do-files for analysing longitudinal demographic surveillance data and this is extremely important given the fact that the major challenge the centres face is their ability to analyze their data utilizing longitudinal structure of the data. Clearly results from this pilot project should inform on future work which we hope IDRC will be willing to consider.

Finally, as part of the project, we have recruited a postdoctoral fellow who is resident at the INDEPTH Secretariat and working directly with the head of the scientific research coordination unit and the Executive Director.

**Some scientific results**

The report presents some findings from the four centres facilitated by the project and makes recommendations for possible further work. Since this is a narrative report, we do not intend to delve deep at this stage into very complicated statistical analyses. As noted earlier the key outcome will be publications in major peer-review journals. Nevertheless, we present some key finding emanating from the project. Results presented are mainly in the form of graphs. We show for each centre some of the key findings on fertility, mortality and changes in the causes of death over time. For both fertility and mortality we show overall trends and age-specific rates in each case. For the papers planned, we anticipate to add some socioeconomic indicators (socio-economic status and social development indicators) to try to explain the unfolding transitions in population and health in Africa and Asia.

**Fertility transition**

Generally, our analysis show that fertility in Matlab has decline considerably over the years during the 1985-1989 period to the recent 2005-2009. As expected, highest fertility rates are observed among the 20-25 and 25-29 year age groups with lowest
fertility rates among the 45-49 year group. In other words the peak reproductive age range for Matlab is 20-29 years. The evidence is that this fertility decline in Matlab is not restricted to a particular age group, but more generally across all age groups. It is also noteworthy that the decline over the period is largest for the same age groups where fertility is highest.

For Agincourt, a similar pattern of declining fertility is observable over the period under consideration (from 1990-1994 to 2005-2009). While the fertility decline is also general across all age groups, one peculiarity of the Agincourt case is that the magnitude of the decline from the early 1990s to the most recent period (2005-2009) seems to be the same across all the age groups. Also, unlike for Matlab, the difference in fertility rate for the peak ages (20-29) and that for the adolescents (age group 15-19) appears to be rather small.
In the case of Navrongo, though the period under consideration is slightly shorter (from 1995-1999 to 2005-2009), a similar pattern of general fertility decline across all age groups is observed over time. Throughout the period the highest fertility rates can be observed among the 25-29 year age group and the lowest fertility rates among the 45-49 year group. Although fertility has declined among all age groups the extent of decline is not the same. The largest decline seemed to have occurred among the 20-24 years group while the smallest decline occurred among 25-29 year group. Like in the case of Matlab and unlike for Agincourt, there is a huge difference in fertility rates for the adolescents (15-19) and the rates for the 20-24 age group.
FilaBavi which provides shortest period of observation or data points is a more peculiar case. Between 200-2004 and 2005-2009, there is a slight decline in fertility. However, the decline does not appear to be uniform across all ages but rather seems to be concentrated in the age group 15-19 and 20-24 years. For the age groups 25-34, there are signs of a slight increase in fertility. For the two period considered fertility rates are highest among the 20-24 year olds.
Mortality Transition

Results for matlab show a steady decline in both all cause mortality and fertility over time. All cause mortality declined from over 100 per 1000 during the early 1990s to about 60 per 1000 during the recent period (2005-2009) as depicted by the graph below.

This decline in all cause mortality is consistent with what is observed in the age-specific mortality rates. The graph for age-specific mortality rates show that mortality decline over the period occurred across all ages, with a larger decline at the younger ages.
The results for Agincourt point to a rather unique story of reversal in mortality decline. From the early 1990s, it is observed that mortality has been increasing contrary to what is observed in the other populations. Clearly the increase in mortality is largest for the adult ages. The hump in the young adult ages clearly reflects the impact of HIV/AIDS in this population.
Results for Navrongo show consistent decline in both fertility and mortality over time, as depicted in graph below. As the graph suggest, all cause mortality declined from close to 150 per 1000 during the late 1990s to a little below 100 per 1000 during the recent period (2005-2009).
The declines as observed in the trends portrayed above are corroborated by the age-specific fertility rates shown earlier and the age-specific mortality rates shown also below. Though the decline in mortality occurred across all ages, the magnitude of the decline is larger for the younger ages which is clearly consistent with the facts that efforts to reduce mortality have focus more on the infants and children.
Given the comparatively low mortality levels in Filabavi (below 50 per 1000), the results show virtually no change over the period under consideration. There is however indications of a slight decline in fertility.
The more or less constant trend in mortality is further corroborated by the age-specific mortality rates shown below.

The Health transition

One important component of this project relates to the health transition measured by the changing patterns in causes of death in the populations considered. Our results show generally that over the period under consideration, the populations have witnessed an increased burden of non-communicable diseases relative to the burden of communicable diseases.

We present graphs showing result for Agincourt, Navrongo and Matlab all of which clearly demonstrate an increasing burden of noncommunicable diseases over the period of observation.
Predicted Probability of Dying by Age Over Time
Noncommunicable in Agincourt

Log Probability of Dying (per 1,000)

Age

95% CI 1995–1999 2000–2004

Multinomial logistic regressions on sex, age, and time

Predicted Probability of Dying by Age Over Time
Noncommunicable in Navrongo

Log Probability of Dying (per 1,000)

Age

95% CI 1995–1999 2000–2004

Multinomial logistic regressions on sex, age, and time
Conclusion and recommendations

Findings presented in this report clearly suggest that the demographic and health transition is well underway. Both fertility and mortality have been decline over the periods of observation for each centre, except for Agincourt which has rather witnessed increases in mortality over the period. Clearly there seem to be a direct relationship between mortality decline and fertility decline. We expect declines in mortality to be associated with corresponding declines in fertility, which is what is observed in most instances, except for the Agincourt population.

The rise in mortality in Agincourt is associated with the HIV/AIDS pandemic which is ravaging populations of southern Africa. The elevated mortality observed in the young adult age-groups lends credence to the observation that the increase in mortality in the population from Agincourt is due to the impact of HIV/AIDS. Indeed, HIV/AIDS clearly poses a challenge to classical transition theory.

The results of the cause of death data suggests that while infectious diseases such malaria, Tuberculosis, etc continue to persists noncommunicable diseases are assuming higher dimensions in these areas which again presents a different picture from what
classical transition theory suggests. What the results suggests is that we are witnessing a double burden of disease in settings that are poor and constrained in resources.

Clearly, the findings from these four pilot centres suggest that demographic and health surveillance data represent an important source of data for examining the demographic and health transitions in the developing world. There is urgent need to broaden this work to cover data from more centres in order to be able to definitely characterize the transition in the developing world.

Appendix
1. Financial Report