



## Centre for Global Health Research (CGHR)

CGHR was established in 2003 to conduct large scale epidemiological studies in developing countries. CGHR is co-sponsored by St. Michael's Hospital and the University of Toronto. It has offices in Toronto, New Delhi, Bangalore and Chandigarh. CGHR is affiliated with the Centre for International Health, the McLaughlin Centre for Molecular Medicine and other partners at the University of Toronto.

CGHR focuses its research on the epidemiology and prevention of premature mortality in developing countries, specifically the measurement of risk factors such as smoking, alcohol, blood pressure, blood lipids, diabetes, obesity, and HIV-transmission related behaviour. Our research involves mega-scale population-based studies with "large, simple" prospective and retrospective methods to measure health and its determinants.

### Study of 1 Million Deaths in India

Working with the Indian government and global collaborators, we have designed and implemented two prospective studies involving nearly 14 million people in 2.4 million nationally representative Indian households. Households are monitored for the health status of their members and if a death has occurred, the causes of death are determined through verbal autopsy. About 300,000 deaths from 1998-2003 and 700,000 deaths from 2004-2014 are expected; of these approximately 850,000 will be coded by two physicians to provide causes of death by gender, age, socioeconomic status, and region. These prospective studies will reliably document established risk factors for premature mortality by monitoring the development of disease in individuals with or without these risk factors. This pioneering study is important to other developing countries that are considering measuring mortality rates and will provide improved global health statistics. Our planned addition of biological samples to the study will permit examination of the genetic and biological aspects of disease.

### The "Verbal autopsy" to Document Causes of Death

A reliable means of measuring the causes of death in India and other developing countries is urgently needed for the development of tools to confront pressing public health issues. Over 75% of the annual estimated 9.5 million deaths in India occur in the home without medical attention, meaning that the majority of deaths lack a certified cause. We have developed a widely practicable "verbal autopsy" tool to document causes of death in these situations. Preliminary results from over 35,000 deaths in a prospective study (plus some 80,00 deaths from earlier retrospective studies) suggest that verbal autopsy can determine the leading causes of death, minimize misclassification of causes, and give the probable cause of death when unreported. Two independent teams give consistent cause-of-death patterns using this tool. Verbal autopsy can broadly classify the underlying cause of death in about 90% of cases for people younger than 70 years old. For people older than 70, its results are less accurate.

### Reliable Large-Scale Measurement of "Established" Risk Factors.

Our study of 1.1 million households surveyed in 1998 in India found that male smoking and alcohol drinking varies greatly between areas (few females report smoking or drinking). Smoking rates can differ by a factor of ten from one state to another and the education levels and the socioeconomic demographics can also vary profoundly. We recorded large differences in living conditions (type of housing, water and sanitation access, indoor air pollution), and fertility practices—which are particularly relevant for child survival.

In a study that garnered worldwide media attention, we found that 30-40% fewer girls are born than expected to women in India that have already had at least one female birth than expected. This difference can only be explained by the use of prenatal sex determination and selective abortion of

female foetuses, which we conservatively estimate to account for about 0.5 million missing female births a year.

### **Innovative Retrospective Methods to Study Risk Factors**

In addition to studies that track deaths as they occur, risk factors for premature death can be identified by comparing retrospective data on dead and living individuals in households. Our study using these methods in Chennai found that throughout middle age, the death rates from medical causes of smokers were double those of non-smokers. Tuberculosis and vascular deaths accounted for much of this excess mortality. Assuming disease rates are similar across India, half of all tuberculosis deaths in India could be due to smoking. The same study suggests that smoking spreads tuberculosis by converting latent infections to active disease. We also use "proportional mortality" methods to study risk factors. Preliminary studies of childhood deaths in Northern India found that 61% of children who died of vaccine-preventable diseases were not immunized in contrast to 40% of children who died from injuries. These results suggest that half of vaccine-preventable child deaths could have been avoided. Using these two retrospective methods, we will examine factors such as immunization rates, childhood malnutrition, alcohol, and male time away from home as a proxy of HIV-related sexual risk taking.

### **Ensuring Epidemiology is Relevant to Control Programs Worldwide**

One of CGHR's priorities is to ensure that epidemiological evidence is used and understood by program officials in developing countries and international institutions. Research on tobacco epidemiology by Dr. Prabhat Jha, the director of CGHR, led to two influential reports on tobacco control. These reports formed the technical basis of the WHO's Framework Convention on Tobacco Control, a worldwide treaty to reduce tobacco use. CGHR's HIV-1 studies helped demonstrate the effectiveness and practicability of peer-based education and condom programs to interrupt HIV-1 transmission from female sex workers to male clients. Such strategies

were the basis for the World Bank's \$200M control program (1999-2005), and the Bill and Melinda Gates Foundation program (2004-2008) in India and in other countries. Partly as a result, HIV-1 prevalence among young women in South India has fallen by about 40% since 2000. Dr. Jha led the analytic work for the WHO's Commission on Macroeconomics and Health and is a co-editor of the Disease Control Priorities Project ([www.dcp2.org](http://www.dcp2.org)), which will synthesize evidence on the effectiveness of interventions across some 80 conditions and risk factors to reduce premature mortality.

### **HIV-1 Spread in Developing Countries**

We have been actively researching the causes of HIV-1 spread. This includes systematic reviews of interventions to reduce HIV-1 transmission, mathematical modelling and trend projection in Botswana and India, meta-analyses of 173 African and 6 Indian epidemiological studies, quantifying factors related to infection among 32,000 attendees at voluntary counselling and testing centres in Tamil Nadu, ecological factors of HIV-1 in 115 areas and documenting HIV-1 trends among 424,000 women in India from 1998-2004.

### **Evidence-Based Course on HIV/AIDS Programming in Developing Countries**

CGHR, in consultation with advisors from UNAIDS, WHO, and the Global Fund for HIV, TB and Malaria, and with support from the International AIDS Society, developed and successfully implemented 'The Short Course on Evidence-based HIV Control for Program Managers from Developing Countries' from Aug. 19-24, 2006. The program involved five days of intensive learning on current issues of HIV/AIDS in developing countries, the evidence available and its policy implications. The course brought together a group of 30 policymakers, government officials and program managers from 21 countries in Asia, Africa and the Caribbean. This event provided a unique platform for future networking, global knowledge exchange and supportive interaction among participants and faculty.