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Role of ICDDR,B in addressing avian influenza in Bangladesh
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After sporadic outbreaks in some parts of Bangladesh in mid-2007, bird flu caused by avian influenza virus has recently spread at an epidemic scale in nearly 70% of the poultry farms, thus jeopardizing the future of this rapidly-growing agro-industry in Bangladesh and posing a threat to public health in the country. Although no evidence of bird-to-human transmission of avian influenza is reported so far in this country, this emerging issue needs to be addressed at this primary stage to avert a suspected epidemic among humans. Evidence from other Asian countries close to Bangladesh reveals that the avian influenza virus circulating in birds, especially migratory wild birds, often mutates to generate newer strains that are easily transmissible to humans. And once a bird-to-human transmission occurs, the mechanism is likely to be accelerated resulting in an epidemic with high case-fatality rate among humans.

As part of a larger project for influenza surveillance in Bangladesh, ICDDR,B has included avian influenza in its agenda. The Bangladesh Government is well aware of the public health consequences of this situation and is partnering with the Centre to address this emerging health issue.

The Centre's surveillance for avian influenza, initiated in August 2007 covering only a live bird market at Mohonganj upazila of Netrakona district, has gradually proliferated to other sites, including Rajshahi, Natore, Sunamgonj, and Chittagong. The primary goal of the surveillance is detection of avian influenza and related diseases from poultry in live bird markets and backyard farming in the rural and peri-urban areas. A passive surveillance is also ongoing with the aim of collecting specimens from poultry suspected to be infected with highly pathogenic avian influenza virus and to analyze the specimens for characterization of the strains that are currently circulating. All these are being done under the assumption that early detection and characterization of the virus, followed by quick and safe culling of infected and exposed birds, can stop further spread of the virus.

Ducks have also been brought under surveillance for collection of tracheal, cloacal, and/or faecal specimens once a month from the surveillance sites. Ducks are considered silent carriers of the influenza virus, which they can spread without showing any signs of the disease. In addition to collecting specimens, demographic information from the poultry owners and/or sellers is recorded to trace the actual locations of outbreaks.

For the time being, a part of the existing Virology Laboratory has been renovated to set up a biosafety laboratory with level 2 facilities where samples collected under both active and passive surveillance are stored at –70° C for analysis. A specialized biosafety laboratory with level 3 facilities is now under construction at ICDDR,B, which is expected to be completed by the end of 2008. The frozen samples will be analyzed in detail after opening of this lab equipped with modern facilities to study all kinds of virus. By February 2008, the ICDDR,B's surveillance system for avian influenza has collected 392 tracheal, cloacal and faecal specimens from live hens and ducks covering 151 villages in 18 upazilas of five districts. Most (91.84%) specimens were collected under active surveillance and the remaining 8.16% under passive surveillance.

The Centre signed a Memorandum of Understanding with the Bangladesh Department of Livestock in September 2007 for collaboration in specimens and data collection, diagnosis, training, and research on avian influenza. The Institute of Epidemiology, Disease Control and Research (IEDCR) in Bangladesh continues to be a partner of ICDDR,B in the larger hospital-based influenza surveillance with financial support from the Cen-

Aliquoting of specimens in the existing biosafety (level 2) lab facilities within the Virology Laboratory of ICDDR,B

ters for Disease Control and Prevention, USA. In the case of epidemic spread of avian influenza in humans, this surveillance system is also likely to be actively involved in addressing this emerging public health threat in Bangladesh. Under this surveillance system, six public and six private hospitals are working in close collaboration with ICDDR,B. These hospitals, spread all over Bangladesh, are: Dhaka National Medical College Hospital, Community Based Medical College Hospital, Jahururl Islam Medical College Hospital, Rajshahi Medical College Hospital, Shaheed Ziaur Rahman Medical College Hospital, LAMB Hospital, Bangabandhu Memorial Hospital, Comilla Medical College Hospital, Khulna Medical College Hospital, Jessore General Hospital, Jalalabad Ragib-Rabeya Medical College Hospital, and Sher-e-Bangla Medical College Hospital.

Bangladesh is thus prepared to combat the suspected avian influenza epidemic: be it confined within poultry or be it transmitted to the general population. The Bangladesh Government, ICDDR,B, and other partners in the influenza surveillance system consider this preparedness an urgency at the time because of the past experience of high case-fatality rate in avian influenza outbreaks in various parts of the world. The influenza pandemic of 1918-1919 attacked 25% to 30% of the world population, resulting in an estimated total of 40 million deaths, and the pathogen that caused acute illnesses in the patients were reported to be an entirely avian-like virus directly adapted to humans.

The recent scenario is also alarming. A new strain of highly pathogenic influenza A (H5N1) virus has been circulating among birds in Asia since 1996. Bangladesh is one of the sixty-one countries that have reported outbreaks by December 2007. Outbreaks of avian influenza due to H5N1 virus in poultry and non-migratory wild birds (mostly crows) have been reported in the past few months from 40 of the 64 districts of Bangladesh. It is not unlikely that the virus, through a process of mutation, may generate a new strain capable of crossing the species barrier to attack humans. What we need at the time to combat the suspected avian influenza epidemic is adequate preparedness. ■

ICDDR,B Perfect Vision 2020

One of a series of internal meetings conducted by Deloitte with Centre's staff

ICDDR,B has launched an enthusiastic exercise to chalk out a new Strategic Plan to the year 2020. Following a decision taken at the November 2007 Meeting of the Board of Trustees, the Centre has hired Deloitte, one of the top five world-renowned consulting firms, to assist in setting our goals for accomplishing these in the next ten years from 2010.

The Plan, called *ICDDR,B Perfect Vision 2020,* is on its way through a participatory process. Staff representatives from all levels working in various divisions, units, and branches are being involved in group discussions with Deloitte to express freely what changes in the Centre's activities they envision and how these can be accomplished in the coming decade. Deloitte, through a presentation at the launching ceremony, highlighted a framework, outlining steps to be taken for finalizing the Plan.

Before placing it for approval at the next June 2008 Meeting of the Board of Trustees, input from representatives of the development partners group comprising the past and potential donors, and collaborating organizations is also being sought.

Deloitte, in their course of action, will have a series of meetings to solicit opinions of several collaborating institutions, including Johns Hopkins University, USA; Harvard University, USA; London School of Hygiene & Tropical Medicine, UK; Centers for Disease Control and Prevention, USA; and Australian National University in Canberra.

Arrangements are also underway to collect input through videoconferencing with organizations engaged in work similar to those at the Centre. Online feedback through our website will also be solicited.

Dr MA Salam, heading the core team, can be contacted in this regard. ■

Population Studies at ICDDR,B: An Overview

The Population Sciences Programme of ICDDR,B works to understand a wide range of issues relating to changes in the population of Bangladesh. The Programme focuses on work to identify why the decline in fertility rates has levelled off in the country and on efforts to understand the health problems of adults and the elderly, and how best to provide support to them. The Programme also studies rural-urban migration and changes in health equity and monitors interventions to better manage health and population challenges in Bangladesh and other areas of the world.

From a review of the population challenges for Bangladesh in the coming decades, ICDDR,B is expanding its research agenda taking into account the following facts:

The current population of around 147 million in Bangladesh is likely to double in the next 50 years, with a major shift from a young population to a much-older population with consequent implications for healthcare, especially for non-communicable diseases (diabetes, for example, may increase almost three-fold, one-quarter of which will be due to increasing population size, and three-quarters of the increase will be due to ageing of the population). Another major demographic phenomenon is the continued migration from villages to cities, resulting in population growth in the urban slums, with predicted serious health and social consequences. This implies a need for urban planning

for low-income populations, possibly along the lines of those in neighbouring Asian countries.

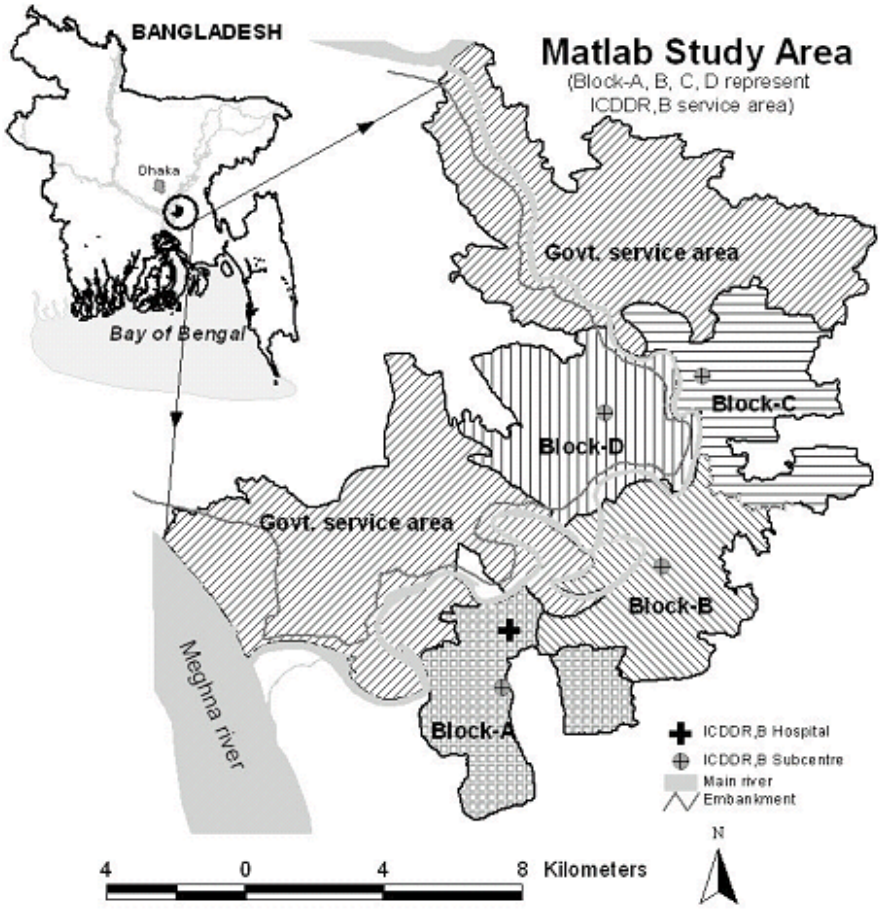
Whatever policy and programmatic changes occur in this densely-populated country, agricultural production is reaching saturation, posing a threat of food scarcity leading to widespread malnutrition and other health problems. This situation underscores the importance of population studies that relate not only to population issues but also to a wide range of public health issues in the years to come for better planning to set the future research agenda and undertake public health interventions.

Infrastructural facilities

Since the population transition in other developing countries is guided by similar dynamics, Bangladesh provides ICDDR,B a unique opportunity for research into the global population problems and health challenges in real-world settings. The Centre's Health and Demographic Surveillance System (HDSS) in Matlab under Chandpur district of Bangladesh, established in 1966, is the oldest and the largest of its kind in the developing world. Community Health Research Workers (CHRWs) collect meticulous information on vital events, like birth, death, marriage, divorce, migration, socioeconomic indices, incidence of illness episodes, and reproductive health-related complications, by visiting each household monthly in their assigned areas to fill up the event registration forms for each individual from birth till death or out-migration. The Field Research Supervisors (FRSs) oversee the activities of CHRWs. After necessary cleaning, these data are directly stored in computers for use by researchers around the world. The datasets of HDSS-Matlab have been used in more population studies than any other longitudinal socio-demographic database in the developing world.

The demographic surveillance systems at the Centre's field sites in Mirsarai under Chittagong district and in Abhoynagar under Jessore district, established later than Matlab, are also now following almost similar methodologies in longitudinal data collection. The HDSS in Mirsarai and Abhoynagar together has earned membership in the INDEPTH Network based in Ghana while HDSS-Matlab earned its membership earlier. Another comparatively new field site of ICDDR,B in Chakaria under Cox's Bazar district joined the earlier three in getting a membership in the INDEPTH network in 2007.

Addition of a Geographic Information System (GIS) component in 1994 to the surveillance system in Matlab has facilitated linking of information about location that allows scientists and others to analyze what happens where, and then to examine how different features and occurrences may relate to one another.



Map showing the Matlab study site

Using GIS facilities, ICDDR,B scientists in Matlab have been analyzing trends in various diseases and public health problems, creating disease maps that tell us where diseases are occurring and whether clusters of diseases are forming. Using GIS, researchers are able to analyze disease occurrence and its relationship with many other variables, helping us find the causes and sometimes solutions to them. For example, using GIS, scientists can compare areas of cholera outbreak with the location of tubewells.

During 2005, the GIS mapped all tubewells in Matlab and recorded the spatial data. This has been the basis for arsenic studies. Work to map the location of ponds, ditches, and water bodies in Matlab was also completed. GIS has also produced adjusted maps that show the numbers of deaths among children aged less than five years, as well as birth cohorts and population by country.

Over the decades, HDSS has recorded data using simple paper forms entered by hand, first into books and then into a computerized database in Matlab.

Today, a new technology is introduced in Matlab, allowing the existing paper forms to be scanned using OCR, and data to be entered directly using Personal Digital Assistants (PDAs), through essentially handheld computers thus completely bypassing the use of paper forms.

Data collected by Community Health Research Workers through home visits are stored in computers, after necessary cleaning, for future processing and use

Recently, a Kodak i40 series/i1200 scanning system has been introduced, which eliminates the need for manual data entry. Some HDSS forms will have to be redesigned to enable the scanner to properly recognize text. Once scanned, the OCR data can be exported into various formats, including Open Database Connectivity Format, a programming that allows the use of data in several standard programs.

Interviewers have had a very positive response to the change, noting that the quality of data would likely improve. Interviewers also express a sense of pride about using the new technology. Once information is entered into the PDAs, it can be linked to a PC via a USB port and synchronized. Data can then be exported directly to the destination database and data-matching is performed to extract the required variables.

A unique advantage of these longitudinal socio-demographic data available at the Matlab field site for population studies is the segmentation of the study site into two areas: the ICDDR,B Area' which receives services provided by any interventions and the 'Government Area' which receives services provided by the usual Government facilities and none from the ICDDR,B interventions. Thus, it is easier to design a study in the case-control model without fresh manipulation of variables. By selecting a parameter as an independent variable, the changes in the ICDDR,B Area can

Kodak i40 series/i1200 scanning system

be cross-matched with a group of subjects with similar demographic characteristics, e.g.. age, sex, occupation, socioeconomic status, etc. This comparison provides a sound scientific validity to the impact studies of any interventions.

Highlights of studies done

In the near future, deaths from communicable diseases and pregnancy-related complications will decline in Bangladesh from about a half to less than one-third of all deaths. By contrast, non-communicable diseases will account for over half of all deaths. This transition will be reflected in other developing countries as well. Thus, Bangladesh provides the Centre a unique opportunity for research into these changing patterns of health challenges that affect developing nations now and in the future. Studies done at ICDDR,B on various aspects of population sciences have regularly been published over the years in the Centre's annual reports, project reports, working papers, and special publications as well as in peer-reviewed national and international journals. Various national and international seminars and conferences have also been a platform for presentation of the findings of studies done by our scientists. This article presents a brief overview of those studies that have long-term implications in designing future strategies to address public health issues arising from population dynamics.

Bangladesh is said to be a success story in family planning and population control over a short period of time. The Government of Bangladesh has largely used ICDDR,B's research findings and recommendations in

accomplishing this goal. The Bangladesh model of family planning is now being widely replicated in other developing nations. Population scientists in the Centre have analyzed the dynamics of how the decline in fertility rates in the Bangladesh population has levelled off. The thematic areas listed below reveal our major research interests since inception of the Population Sciences Programme at the Centre in 2001.

Review of population challenges for Bangladesh in the coming decades; Selected maternal health indicators obtained by the geographical reconnaissance; Demographic, programmatic, and socioeconomic correlates of maternal mortality; Levels and socio-demographic differentials of non-communicable disease risk factors among adults: findings from the WHo StePS survey; Links between fertility changes and mother and child mortality; Non-communicable diseases among adults born to mothers exposed to famine during pregnanc; Ageing of the Bangladesh population: mortality and morbidity; Daily activities of the elderly in Bangladesh; Disease burden in Bangladesh; Maternal, infant and child morbidity and mortality; Causes of death; Gender and fertility; Plateau in fertility decline in Bangladesh; Compliance with condom use: implications for HIV/AIDS; Adolescents and abortion; Social change and reproductive behaviour; Spatial dynamics and dengue outbreak; Effect of birth spacing on infant and child mortality; Pregnancy spacing and maternal morbidity; Health interventions and socioeconomic inequalities in mortality of children; Measuring household economic status in rural Bangladesh: can asset-based indicators replace household income and expenditure?; Women's mobility and abortion; Spousal communication and contraceptive use; Infertility and divorce; Effect of health interventions on health equity; Care, support, and living arrangements of the elderly in Bangladesh; Rural-urban migration; Pattern of healthcare-seeking for sick children in rural Bangladesh; Patterns of survival by season of birth in rural Bangladesh and Gambian populations; Effect of infant immunization on childhood mortality; Empowerment of women; Population, poverty and health; Fertility and family planning; Deaths from drowning; Family size and education. Along with scientific investigations into these issues, conducting periodic household censuses for socio-demographic indicators and surveillance for various health problems in rural Bangladesh is a regular activity of the Programme.

Our findings and recommendations have global impact in both population issues and clinical research and services. This is evidenced from the list of institutions and agencies we work with. The current collaborating institutions and agencies at the national level include the relevant health departments of the Government of Bangladesh and a private institution Bangladesh Institute of Research and Rehabilitation for Diabetes, Endocrine and Metabolic Disorders (BIRDEM). International institutions and agencies include Karolinska Institute in Sweden, DFID, USAID/Dhaka, RAND Corporation, Pathfinder International, London School of Hygiene & Tropical Medicine, Medical Research Council, UK, World Bank, Rockefeller Foundation, and INDEPTH Network. ■

New sweet potato variety being analyzed

A new variety of sweet potato has been identified as a potential source of dietary ß-carotene, which improved vitamin A status in a study population in Africa. The results of African studies stimulated investigators to undertake similar studies in other countries, including Bangladesh. This sweet potato is highly digestible even in young children and contains roughly 70 µg of ß-carotene/g. On average, 100 g of this variety can, thus, provide 580 µg retinol (vitamin A) which is more than the daily requirement for preschool children.

The sweet potato also contains other natural antioxidants, such as lycopene. ICDDR,B has undertaken an efficacy feeding trial funded by HarvestPlus, USA, among a population group in the Mirpur slum of Dhaka city. This new variety of sweet potato is under experimental production at the Tuber Crops Research Centre (TCRC) of the Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur. After an adaptation trial under Bangladesh conditions, the seeds will be made available to farmers for mass production.

Dr Mahmuda Akter in her lab with two trainees

The ß-carotene content of this new variety of sweet potato is being routinely checked at the Nutritional Biochemistry Laboratory of ICDDR,B. As seen in the picture, Research Officer Mahmuda Akter, who has been conducting the experiment, is showing the yellow pigmentation in the separating funnel in petroleum ether to two trainees: Hiromi Okada, a Masters-level student from the University of Tsukuba, Japan and Nusrat Jahan, an MSc student of the Biotechnology Department of North South University, Dhaka. ■