



## NON-COMMUNICABLE DISEASES: FUTURE LEADERS IN DEVELOPING WORLD

**Dr. Shayri Pillai\***

Ministry of Health, Liberia.

**\*Corresponding Author: Dr. Shayri Pillai**

Ministry of Health, Liberia.

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### Non

Communicable diseases (NCDs) are currently responsible for 35% of all deaths in low and middle income countries. The World Health Organization projects that the burden of disease due to NCDs will increase rapidly in the years ahead. The total of 50 million deaths from all causes in 2014, it was estimated that NCDs would account for 35 million deaths, which was double the number of deaths from all the communicable diseases (including HIV/AIDS, tuberculosis and malaria), maternal and perinatal conditions and nutritional deficiencies.

This epidemiological transition in global health from infectious diseases to NCDs is posing not only a threat to the health of those affected but also places an enormous burden on the health system of nations, particularly those of the least developed countries, as they must now address a double burden of acute and chronic diseases amidst scarcity of resources. Furthermore, this epidemiological transition is adversely impacting on socio-economic development of nations, as NCDs tend to be more prevalent in young working class people. As a more sophisticated workforce becomes a highly valued and harder to replace economic investment, the increasing prevalence of NCDs risk factors in developing countries. This is becoming a real threat to economic progress, adversely impacting on all the previous gains made in combating HIV, malaria, tuberculosis and other infectious disease.

The theory of the epidemiological transition provides a framework for considering changing disease patterns, and the determinants of those patterns within population. It also includes change in population fertility and mortality (demographic change), the relationship of these to disease patterns and the relationship of both of these to economic, social and technological changes. Chronic non-communicable diseases (CNCDs) are reaching epidemic proportions worldwide. These diseases — which include cardiovascular conditions (mainly heart disease and stroke), some cancers, chronic respiratory conditions and type 2 diabetes — affect people of all ages, nationalities and classes.

Why NCDs are progressively becoming predominant health problem in 21<sup>st</sup> century? The answer to this question is summarized on the basics of 4 main models of epidemiological transition.

1. The classical or western model

A gradual progressive decline from high to low mortality and fertility taking place over several centuries. This accompanied the process of modernization in most western European and North American societies.

2. The accelerated model

A much faster decline in mortality and fertility than in the classical model, taking place over decades rather than centuries. Examples include Japan, Mauritius and Seychelles

3. The contemporary or delayed model

The recent and yet to be completed transition in many low income countries, often with a high burden from old and new infectious diseases (e.g. HIV) while NCDs gain increasing importance.

4. The polarized model

Different sections of the population at different stages of the transition, strongly related to both economic inequity and different levels of urbanization within those populations.

These models describe different rates of moving through the stages described above, ranging from one or more centuries in the classical model to a few decades in the accelerated model. The models also reflect that some populations continue to have high levels of infectious disease even as NCDs emerge (the delayed model), and that in some populations (usually those with marked economic inequity) subgroups are at different stages (the polarized model).

What are the socioeconomic impacts of NCDs? NCDs threaten progress, towards the 2030 Agenda for Sustainable Development, which includes a target of reducing premature deaths from NCDs by one-third by 2030. Poverty is closely linked with NCDs. The rapid rise in NCDs is predicted to impede poverty reduction

initiatives in low-income countries, particularly by increasing household costs associated with health care. Vulnerable and socially disadvantaged people get sicker and die sooner than people of higher social positions, especially because they are at greater risk of being exposed to harmful products, such as tobacco, or unhealthy dietary practices, and have limited access to health services. In low-resource settings, health-care costs for NCDs quickly drain household resources. The exorbitant costs of NCDs, including often lengthy and expensive treatment and loss of breadwinners, force millions of people into poverty annually and stifle development.

The predominance of death from non-communicable diseases (NCDs), as opposed to infectious diseases, is the hallmark of the epidemiological transition.<sup>1</sup> In high-income countries, this transition occurred generations ago, and now NCDs generally represent diseases and causes of death of the elderly. However, NCDs are not just diseases of older, wealthier populations; they are now poised to be the dominant cause of death in developing countries. The earlier onset of NCDs in low-income countries means that deaths and disability occur during economically productive ages. Since the behavioral risk factors that drive most of these diseases can be addressed during adolescence, there is an opportunity for primary prevention. While primary prevention does not eliminate the need for secondary prevention and treatment of disease, it does offer an opportunity to lower the burden on individuals, families, health systems, communities, and nations.

For a comprehensive response, many sectors outside of the health care arena need to be involved. One way to heighten attention to primary prevention and articulate what other sectors could do is through attention to adolescence as a critical life transition point and an opportunity for intervention to lower lifelong risks for NCDs. The potential for intervention during adolescence, other life stages also represent important intervention points. A broad life-cycle approach has many potential benefits, since there is a growing literature linking nutrition in early years—even prenatally—to diet and the ability to maintain a healthy weight in later life. However, two of the main risk factors—tobacco and alcohol use—typically begin during adolescence, and as young people take more responsibility for their lifestyle choices, adolescence may be an ideal time to reinforce healthy habits. Establishing and/or reinforcing healthy habits during adolescence is not without challenges, but changing well-ingrained habits later in life is likely more difficult. Adolescence may not be the best time to instill positive behaviors, nor is it the last time, but it presents a valuable window of opportunity at a critical life cycle stage.

Non-Communicable Diseases in Low- and Middle-Income Countries

Developing countries—that are, the low- and middle-income countries (LMICs)—now face an increase in the proportion of deaths that result from NCDs. Of course, this would be expected with the decline in infectious diseases. But, the proportion of deaths attributable to NCDs is only part of the story. It might be tempting to think that these are diseases of the elderly. Death is still a lamentable (but unavoidable) outcome for all of us, but age of death does vary and can be influenced. In LMICs, the age of death from NCDs is far earlier and is more likely to occur during the economically productive years than in higher income countries. Premature death is an additional trauma for families that may rely on that individual for their economic well-being, happiness, and even survival. In high-income countries, 13 percent of deaths due to NCDs were premature, i.e. before the age of 60. However, in middle-income countries, the proportion of premature NCD mortality is 28 percent, and in low-income countries it is 41 percent. Furthermore, the morbidity that often precedes a death caused by an NCD can include serious, life-altering consequences, such as amputations from complications of diabetes or disability from chronic cardiac or respiratory diseases.

#### **Risk Behaviors Among Adolescents**

A first step is to understand the risk behaviors of youth. There are several key data sources that provide insight into the level and nature of compromising health behaviors among adolescents in the developing world. The Global Youth Tobacco Survey (GYTS) is a school-based survey that collects data on students aged 13-15 using standardized methods across the multiple countries implementing the survey. That ensures that the method for establishing the sampling frame, selecting schools and classes, and processing of data are comparable. The structure of the sample allows for national estimates with regional level stratification possible. While there is a common protocol, countries may add questions. The questionnaire is self-administered and address multiple measures of consumption along with other knowledge and attitude measures. To date, 145 countries have participated. Funding is provided by the Canadian Public Health Association, the National Cancer Institute (NCI), the United Nations Children's Fund (UNICEF), and the World Health Organization (WHO). The Global School-Based Student Health Survey (GSHS) was developed by WHO in collaboration with UNICEF, UNESCO (United Nations Educational, Scientific, and Cultural Organization), and UNAIDS (the Joint United Nations Programme on HIV/AIDS) and with technical assistance from the Centers for Disease Control and Prevention (CDC)—This, is also a school-based survey conducted primarily among students aged 13-17. The purpose was to collect data on health behaviors and protective factors that can be used for international comparisons and the establishment of trends and serve as a basis for countries to develop policies, establish programs, and address youth health needs. This survey also uses a standardized sampling process and core questionnaire modules. In

some locations, countries have added specific questions to supplement the core questions. Data are collected with a self-administered questionnaire that can be completed in one regular class period. The core modules are alcohol use, dietary behaviors, drug use, hygiene, mental health, physical activity, protective factors, sexual behaviors, tobacco use, and violence/unintentional injury. More than 100 countries have had people trained in the methodology, and 73 have completed at least one GSHS. More than 420,000 students have participated in the surveys.

A third survey provides international comparisons with data gathered from a household survey instead of a school-based survey. The Demographic and Health Surveys (DHS) have been conducted in more than 90 countries and, for many, in multiple waves. Funded by USAID (the U.S. Agency for International Development), the DHS are a valued resource for international comparisons of health and reproductive behavior. The core DHS survey is of women in the reproductive years, with data collection generally beginning at age 15. There are some country variations, and some countries also include men in their surveys. Sharing a common core protocol, there are country-country variations within the standardized format and training for implementing the DHS. Since the DHS typically includes adolescent women, it provides an additional data point for measures of obesity, smoking, and alcohol consumption.

Each of these surveys provides a view into the health behavior of youth. The GSHS and GYTS are school-based surveys, which could of course limit their coverage. However, school enrollment/attendance is increasing around the globe, helped by the focus given with the United Nations' millennium development goals and activities. But, there could be some gaps in coverage among population groups that have low school involvement. Also, the risk of gaps in coverage is greater when older teens are being considered, but even at young adolescent ages, this can be problematic if specific groups (girls or rural or ethnic groups) have low school enrollment. The DHS is primarily a survey of women in their reproductive years, although some sites include men in the survey. All three of these surveys generate data that are publicly available and built on a shared platform so that the survey design and questionnaires are comparable.

Individual countries, or groups of countries, may conduct other surveys of youth risk behaviors covering an entire country or specific regions, cities, or schools. These surveys provide an excellent complement to the broad national data and, depending on the local circumstances, may go into more details on specific risk factors. The STEPS (STEP wise approach to surveillance) provides a tool to gather data about NCD risks. Supported by WHO, it enables countries to gather data about youth risks, such as tobacco, alcohol, physical activity, obesity, and diet.

STEPS is a valuable resource, but individual country surveys are not necessarily focused on youth.

We might conclude that basic surveillance of youth risk factors does exist for many countries, although not for all countries and not always for identical time periods and ages. There is also a need for more surveys and repeat surveys to assess changes over time in the levels of behaviors that place youth at risk for later disease. The desire for more and better data is universal, but it should not detract from the basic picture of risks that is before us.

#### **Extent of Risk to Youth in Developing Countries**

The Population Reference Bureau (PRB) has arrayed data for youth risk behaviors in LAC (Latin America and the Caribbean) to provide an overview of risks in that region. The measures were mostly from school-based surveys and involved 13-15 years old. There were 27 countries with recent (2008 or later) data on at least three risk categories. For each risk behavior, cut offs were determined to identify countries as being at high, medium, or low risk.

#### **The "Unfinished Agenda" And Non-Communicable Diseases**

The term "unfinished agenda" is often used to refer to the health problems of less developed countries before the onset of the health transition — that is, mainly infectious diseases, malnutrition, and other diseases of poverty. In a cruel twist, some of the causes of non-communicable diseases in these countries are due not to the behavioral risk factors listed above but rather to these "unfinished" problems. Heart disease due to rheumatic fever, for instance, is still a common cause of early-onset heart disease in low- and middle-income countries and the Barker hypothesis proposes that exposure to inadequate maternal nutrition in utero and during the first years of life increases the risk of non-communicable diseases in adulthood.

#### **Risk factors**

Modifiable behavioural risk factors: Modifiable behaviour, such as tobacco use, physical inactivity, unhealthy diet and the harmful use of alcohol, all increase the risk of NCDs.

- Tobacco accounts for over 7.2 million deaths every year (including from the effects of exposure to second-hand smoke), and is projected to increase markedly over the coming years.
- 4.1 million annual deaths have been attributed to excess salt/sodium intake.
- More than half of the 3.3 million annual deaths attributable to alcohol use are from NCDs, including cancer.
- 1.6 million deaths annually can be attributed to insufficient physical activity.

#### **Metabolic risk factors**

Metabolic risk factors contribute to four key metabolic changes that increase the risk of NCDs:

- Raised blood pressure
- Overweight/obesity
- Hyperglycemia (high blood glucose levels) and
- Hyperlipidemia (high levels of fat in the blood).

In terms of attributable deaths, the leading metabolic risk factor globally is elevated blood pressure (to which 19% of global deaths are attributed), (1) followed by overweight and obesity and raised blood glucose.

### Prevention and control of NCDs

An important way to control NCDs is to focus on reducing the risk factors associated with these diseases. Low-cost solutions exist for governments and other stakeholders to reduce the common modifiable risk factors. Monitoring progress and trends of NCDs and their risk is important for guiding policy and priorities.

To lessen the impact of NCDs on individuals and society, a comprehensive approach is needed requiring all sectors, including health, finance, transport, education, agriculture, planning and others, to collaborate to reduce the risks associated with NCDs, and promote interventions to prevent and control them.

Investing in better management of NCDs is critical. Management of NCDs includes detecting, screening and treating these diseases, and providing access to palliative care for people in need. High impact essential NCD interventions can be delivered through a primary health care approach to strengthen early detection and timely treatment. Evidence shows such interventions are excellent economic investments because, if provided early to patients, they can reduce the need for more expensive treatment.

Countries with inadequate health insurance coverage are unlikely to provide universal access to essential NCD interventions. NCD management interventions are essential for achieving the global target of a 25% relative reduction in the risk of premature mortality from NCDs by 2025, and the SDG target of a one-third reduction in premature deaths from NCDs by 2030.

### Strategies for Prevention and Control

For Prevention, Detection, and Treatment of Non-communicable Diseases in Low- and Middle-Income Countries.

To be comprehensive, a program for the prevention and control of non-communicable diseases must integrate policies designed to foster a societal environment in which people are encouraged to make and maintain healthy living choices, promote health literacy so that people can protect and improve their health, and provide health services focused on early detection and cost-effective management of non-communicable diseases and their risk factors.

Population-based interventions include policy measures such as increasing taxation of tobacco and alcohol,

reducing salt and saturated fat and eliminating trans fats in processed foods, and creating smoke-free and exercise-friendly public spaces. Among the risk factors identified as major causes of non-communicable diseases, dietary risk factors and physical inactivity are partially determined by individual preferences but are substantially influenced by the manufacturing and marketing practices of the food industry and by the built and social environments that permit or impede physical activity. Evidence is rapidly accumulating that the consumption of sugared beverages is an important cause of childhood obesity, and in randomized trials, the substitution of lower-calorie beverages is associated with weight loss.

Mass-media messaging as well as health promotion in specific settings (schools, workplaces, and community centers) may be used to provide health education. Preventive interventions include risk-factor assessment and treatment with behavioral interventions and medication for persons at high risk. Although multidrug therapy for persons with established cardiovascular disease is required for secondary prevention, there is also a need to treat persons at high absolute risk for a first serious cardiovascular event. Some evidence-based therapies, such as the administration of generic antihypertensive agents and statins, are low-cost by the standards of high-income countries but are prescribed in low- and middle-income countries for only a small fraction of patients who are candidates for such treatment according to evidence-based guidelines, even though high blood pressure is the leading cause of deaths. Tobacco is the second largest cause of deaths and DALYs worldwide, and tobacco control could prevent about a third of all deaths from cancer in the United States—and could also rapidly reduce deaths from cardiovascular and chronic pulmonary diseases. The WHO Framework Convention on Tobacco Control provides proven tobacco-control strategies that need to be implemented within and between nations. Public-interest litigation and changes in national laws such as the U.S. Tobacco Control Act to provide greater government regulation of the tobacco industry are needed. Increasing obesity rates presage an increase in mortality from a wide variety of cancers.

Thus, obesity prevention is a priority for cancer prevention, as well as for the prevention of cardiovascular disease and diabetes. In countries with infant vaccination against hepatitis B virus, chronic-carrier rates and rates of liver cancer have declined sharply. The recent development of human papillomavirus vaccines for cervical-cancer prevention offers a new opportunity to control the fourth leading cause of cancer deaths in women worldwide. Many cancers are highly treatable, if detected early, and the provision of evidence-based screening and treatment regimens in low- and middle-income countries is an important component of cancer control that requires larger investments in human and capital resources.

Many of these interventions have been identified as cost-effective by the WHO. A series of “best buys” determined on the basis of cost-effectiveness and the feasibility of implementation, have been suggested. For risk-factor reduction, these include tobacco and alcohol taxes, advertising bans and warnings, reductions in salt and trans fat intakes, promotion of physical activity, and hepatitis B vaccination. Health care “best buy” interventions include counseling regarding risk-factor reduction and multidrug therapy for persons at high risk for cardiovascular disease or diabetes, aspirin therapy for those with a history of acute myocardial infarction, and cervical-cancer screening and treatment. These interventions require a complex series of legislative actions, public-awareness campaigns, and public health interventions, as well as adequate numbers of clinical personnel, at least basic clinical facilities, and adequate supplies of drugs. “Interventions in this area will undeniably be costly. But inaction is likely to be far more costly.”

### Challenges To Health System

The global epidemic of non-communicable diseases poses challenges to the health systems of all countries, though the problems vary. High-income countries are confronted by the rising costs of technology-intensive health care for aging populations. The health systems of low- and middle-income countries must address the simultaneous challenges of multiple infectious diseases, undernutrition, and ongoing substandard maternal and child health, which vie with non-communicable diseases for scarce financial and human resources. These problems are compounded by weak disease and risk-factor surveillance systems and lack of access to affordable drugs and laboratory and diagnostic tests.

In low- and middle-income countries, financial protection from the costs of treatment for non-communicable diseases, in the form of public financing or insurance, is limited. The health care infrastructure is also limited, with inadequate facilities for advanced care and shortages of trained medical specialists, nurses, and allied health workers. Paradoxically, some low- and middle-income countries have highly advanced tertiary clinical care facilities in major cities, staffed by very skilled professionals. However, even in such countries, the diagnosis and treatment of non-communicable diseases are usually very deficient at the primary and secondary care levels. In general, the health systems are configured to provide episodic care for acute illness and have not yet made the adaptations required to provide continuous care for chronic illness.

Access to essential drugs is not ensured in many countries, with inadequate supplies of cardiovascular drugs, anticancer agents, insulin and oral hypoglycemic agents, and bronchodilators. An analysis of WHO data from 36 countries showed that the availability of cardiovascular drugs was poor (26.3% of public-sector facilities and 57.3% of private-sector facilities had such

drugs), and a survey of 6 countries by the WHO showed that the monthly cost of treatment with a single antihypertensive medication exceeded several days' wages in many countries. When multiple drugs are used, the cost becomes unaffordable, and this problem is further compounded when more than one family member needs treatment. In low- and middle-income countries, drug therapy for cardiovascular disease is a major contributor to high out-of-pocket health care expenditures, resulting in millions of people being pushed into poverty. Countries such as Thailand and India are resorting to compulsory licensing to domestically produce the more expensive cardiovascular or anticancer drugs. Lack of reform of national and international regulations on opiate production and export means that many patients with cancer are deprived of low-cost drugs such as morphine that could provide pain relief.

### CONCLUSION

Non-communicable diseases will be the predominant global public health challenge of the 21st century. Prevention of premature deaths due to non-communicable diseases and reduction of related health care costs will be the main goals of health policy. Improving the detection and treatment of non-communicable diseases and preventing complications and catastrophic events will be the major goals of clinical medicine. A multi-level approach that integrates policy actions, regulations, health education, and efficient health systems to achieve these goals will be the mission of public health. All countries can benefit by sharing experience and pooling expertise for the prevention and control of non-communicable diseases. NCDs nonetheless contribute substantially to the overall burden at age specific rates that are often several folds higher than those in developed countries.

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