

Globalization, coca-colonization and the chronic disease epidemic: can the Doomsday scenario be averted?

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There are at present approximately 110 million people with diabetes in the world but this number will reach over 220 million by the year 2010, the majority of them with type 2 diabetes. Thus there is an urgent need for strategies to prevent the emerging global epidemic of type 2 diabetes to be implemented. Tackling diabetes must be part of an integrated program that addresses lifestyle related disorders. The prevention and control of type 2 diabetes and the other major noncommunicable diseases (NCDs) can be cost- and health-effective through an integrated (i.e. horizontal) approach to noncommunicable diseases disease prevention and control. With the re-emergence of devastating communicable diseases including AIDS, the Ebola virus and tuberculosis, the pressure is on international and regional agencies to see that the noncommunicable disease epidemic is addressed.

The international diabetes and public health communities need to adopt a more pragmatic view of the epidemic of type 2 diabetes and other noncommunicable diseases. The current situation is a symptom of globalization with respect to its social, cultural, economic and political significance. Type 2 diabetes will not be prevented by traditional medical approaches; what is required are major and dramatic changes in the socio-economic and cultural status of people in developing countries and the disadvantaged, minority groups in developed nations. The international diabetes and public health communities must lobby and mobilize politicians, other international agencies such as UNDP, UNICEF, and the World Bank as well as other international nongovernmental agencies dealing with the noncommunicable diseases to address the socio-economic, behavioural, nutritional and public health issues that have led to the type 2 diabetes and noncommunicable diseases epidemic. A multidisciplinary Task Force representing all parties which can contribute to a reversal of the underlying socio-economic causes of the problem is an urgent priority.

Introduction

Socio-economic factors have a major influence on nutrition, physical activity and health and as a result, on individual and community disease pat-

terns. This is exemplified by the dramatic rise in prevalence of cardiovascular diseases (CVDs), type 2 diabetes, obesity and other noncommunicable diseases (NCDs) in developing and newly developed nations, particularly in the Pacific and Indian Ocean

region, and in Asia [1]. This has resulted in chronic disease epidemics that have occurred concurrently with modernization of lifestyle, a process labelled by the late Arthur Koestler as 'Coca-colonization' [2] and one that we have called 'Paradise Lost' [3]. This scenario is also to be seen in disadvantaged communities in developed nations, e.g. native Americans, Afro-Americans and Mexican Americans in the USA [4], native Canadians [5], Australian Aborigines and Torres Strait islanders in Australia [6] and Polynesians in New Zealand [7].

The discipline of epidemiology provides the basis for understanding the extent and public health implications of these noncommunicable diseases within and between populations. This capability becomes even more important as we face the new millennium, as rather than seeing an improvement in health in developing nations, the situation is becoming worse with secular increases noted in noncommunicable disease rates [1, 8]. This review addresses the present status and attempts to project future noncommunicable disease trends, using type 2 diabetes as an example, and discusses how the situation can be turned around.

The epidemiological transition

This new health paradigm needs to be understood in the light of the phenomenon described by Omram as epidemiological transition [9]. In his book 'The Call Girls' [2], Koestler coined the term 'coca-colonization' to describe the impact of the ways of Western societies on developing countries. The devastating results of Western intrusion into the lives of traditional-living indigenous communities can be seen from the Arctic Circle to the jungles of Brazil and to the remote and idyllic atolls of the Pacific Ocean. With respect to the latter, during the 19th century, early European voyagers brought many infectious diseases such as measles, whooping cough, tuberculosis, influenza and venereal diseases to the Pacific island communities [3]; nearly all of the islands suffered a drastic fall in population numbers as a result of these imported diseases [3].

In the mid-18th century there were about 250 000 Maoris (Polynesians) in New Zealand. The white man's ways and diseases soon decimated their numbers to 90 000 so that by the early 20th century, the Polynesian in New Zealand was regarded as a dying race.

Epidemiology also plays a vital role in providing information for public health planners on the socio-economic impact and determinants of disease, and provides the data and rationale for primary prevention as well as the database to evaluate the interventions used [8].

From a historical and teleological perspective, the main causes of morbidity and mortality in all countries of the world were epidemics of communicable diseases including typhoid, cholera, small-pox, diphtheria and influenza until the latter part of the 19th century [10]. Whilst certain of these diseases remain epidemic in many Third World countries, industrialization and progressive modernization of societies has seen major improvements occur in housing, sanitation, water supply and nutrition. Accompanied by the development of antibiotics and immunization programmes, this scenario has radically changed the profile of diseases, initially in developed countries, and later in many developing countries [3, 10].

With improvements in public health, mortality from infectious diseases has fallen dramatically [10]. Paradoxically, a remarkable increase in the prevalence of risk factors for noncommunicable diseases such as type 2 diabetes, cardiovascular disease, hypertension, and strokes has occurred. These diseases have become major contributors to morbidity and mortality along with certain cancers [8]. The emergence of this noncommunicable diseases cluster illustrates the concept of epidemiological transition [9] as seen in the Pacific and Indian Ocean islands [3], the site of many of our own epidemiological studies relating to diabetes and other noncommunicable diseases. Rapid socio-economic development over the last 40–50 years has resulted in a dramatic change in lifestyle from traditional to modern. Diabetes is now amongst the five leading causes of death by disease in most countries. This may be a conservative ranking as mortality statistics greatly under-estimate the true picture; diabetes is frequently under-reported on death certificates [11].

The island of Mauritius – a microcosm of the diabetes epidemic in India, China and Africa

A carefully planned and executed longitudinal epidemiological study in the Indian Ocean island of Mauritius has provided the best indicator of the type

2 diabetes epidemic occurring in large sections of the developing world [12, 13]. As the Mauritian population (currently 1.3 million) includes people of Asian Indian, Chinese and Black (Creole) descent, and as these ethnic groups constitute nearly two-thirds of the world population, the data from Mauritius provide a microcosm of the global epidemic [1, 8].

Our previous population-based surveys (1987 and 1992) in Mauritius had shown a high diabetes prevalence [12, 13]. The 1987 prevalence of type 2 diabetes was 10–13% in each ethnic group, which rose to 20–30% in those aged 45–74 years. At the most recent follow-up study in 1998 [13], when 6294 subjects were screened for diabetes with an oral glucose tolerance test (OGTT), we found a 30% secular increase in diabetes prevalence in the 11 years from 1987. Diabetes now affects close to 20% of the population over 30 years of age. These results, if extrapolated to parts of India, China and Africa where modernization and industrialization are occurring, would result in huge increases in the number of cases of type 2 diabetes, posing a great public health threat and burden.

Mauritius, apart from demonstrating a high diabetes prevalence and a notable secular increase between 1987 and 1998 in Asian Indians and Creoles [13], also showed the highest yet reported prevalence in people of Chinese extraction. This, and evidence that prevalence of type 2 diabetes doubled between 1984 and 1992 in Singaporean Chinese [14], and the high prevalence in Taiwan [15], provide alarming indications of the size of the future epidemic in the People's Republic of China. Here, the overall prevalence of type 2 diabetes was, until recently, less than 1%. Recent studies show a threefold increase in prevalence in certain areas of China within the last two decades [8]. The scenario is highlighted in Fig. 1 comparing the prevalence of diabetes in Chinese populations in China, Singapore, Taiwan and Mauritius. If China were to experience just one half the current rate of diabetes in Taiwan, the number of individuals with diabetes would increase dramatically from 8 million in 1996 to over 32 million by 2010.

Currently, 2.1% of the total world population could have diabetes but this may increase to over 3.0% by the year 2010 [16]. With increasing

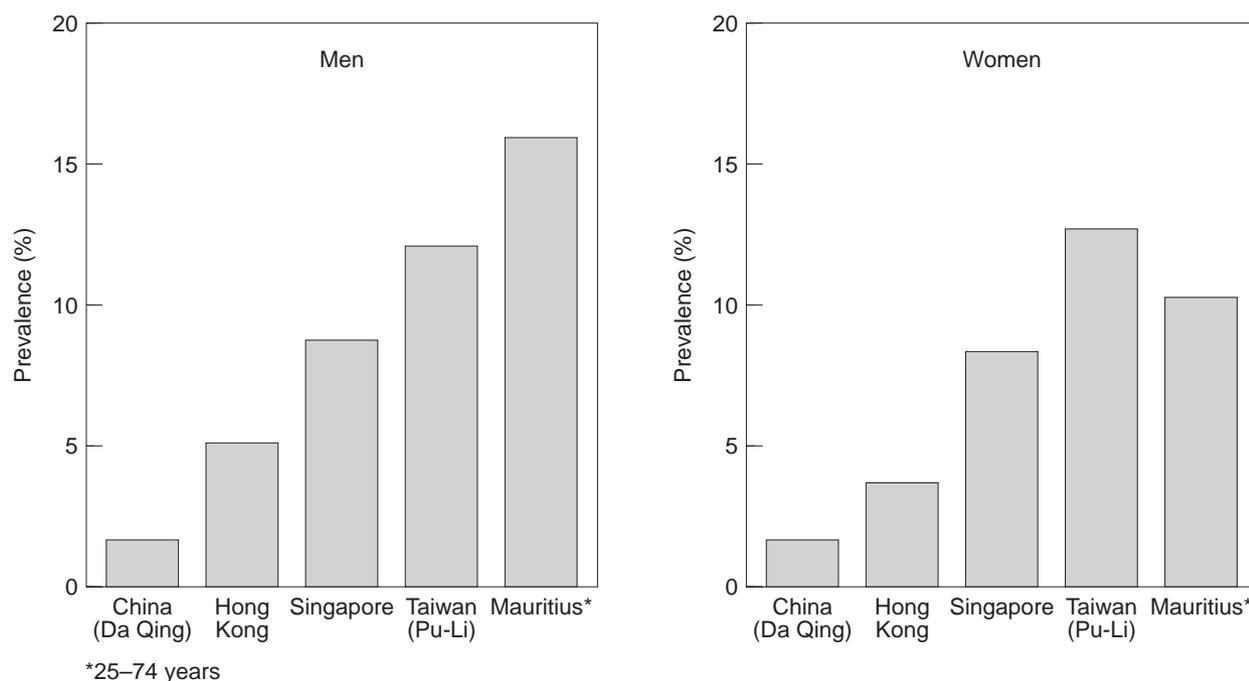


Fig. 1 The prevalence of Type 2 diabetes mellitus amongst Chinese in Hong Kong, Singapore, Taiwan and Mauritius compared to that in the People's Republic of China [3]

longevity, changes in demographic age distributions, rising urbanization and further modernization, the number of people with type 2 diabetes will likely double by 2010. Projections published in 1997 by the International Diabetes Institute indicate that there will be more than 200 million people with type 2 diabetes by 2010 (Table 1) [16].

Are our projections for the year 2010 AD and those of World Health Organization (WHO) for the year 2025 AD [17] too pessimistic? I doubt it! Numerous longitudinal epidemiological studies confirm secular increases in the prevalence of type 2 diabetes [1, 4]. There are no major studies signifying a secular reduction apart from a primary prevention study in Da Qing, China [18]. This study indicates that intervention is feasible but unless similar strategies are implemented widely in communities, it seems unlikely that the epidemic can be stemmed.

Health still remains a low priority agenda item in most developing nations and most resources are still being directed at the prevention and control of communicable diseases [19, 20]. Apart from the health impact, the economic cost of diabetes and its complications are enormous, both for health care and loss of productivity to society. Whilst diabetes costs the USA US \$20.4 billion in 1987 and US \$90 billion in 1994 [21], the most recent estimate is over US \$100 billion [22]. Proper estimates for developing countries such as those in Asia and the Pacific are not available but the impact of diabetes alone is considerable, not just from direct medical costs but also from loss of productivity and premature morbidity and mortality [1, 3].

Globalization and world health

Globalization of the world economy has become the current catch cry of the international community including those in the health arena. Globalization may yet be a thin disguise for a movement that attempts to integrate developing nations into the Western socio-economic and health care models. The latter scenario is one of the recommendations of the World Bank [19] and is not necessarily appropriate for the Third World. We are constantly reminded, as we approach the new millennium, that each of us is a member of the global village. This means little to people in Kosovo, Somalia and other areas of world tension at a time when national

currencies and commodities rise and fall at the whim of Wall Street and institutions in Zurich and other financial centres. The rich become richer and the poor become poorer both financially and in health. We would have expected to have seen improved health outcomes after many years of public health research, but in most instances, the research findings have not been translated into improved health outcomes. There is no better example than that of type 2 diabetes which is now epidemic in many developing nations and in the economically disenfranchised minorities of many developed countries [8]. Globalization does not just apply to economic change but also the human diet [23].

The WHO Report (1999) addresses this issue in detail [24]. It notes that whilst the 20th century revolution in health has led to a drop in birth rates and dramatic gains in life expectancy – transforming the structure of populations and contributing to economic growth – not everyone has benefited [24]. This report points out that over a billion people will enter the 21st century without having participated in the health revolution.

Furthermore, the WHO Report states [24]:

Over a billion people will enter the 21st century without having benefited from the health revolution: their lives remain short and scarred by disease. Many countries must deal with these disease problems of the poor whilst simultaneously responding to rapid growth in noncommunicable diseases: they face a double burden. Large numbers of other individuals, whilst not poor, fail to realize their full potential for better health because health systems allocate resources to interventions of low quality or of low efficacy related to cost. Increasing numbers of people forego or defer essential care or suffer huge financial burdens resulting from an unexpected need for expensive services. The continuing challenges to health ministries and to countries thus remain enormous. New problems constantly arise: witness the emergence of the HIV epidemic, the threat of resurgent malaria or the unexpected magnitude and consequences of the tobacco epidemic. Achieving better health for all is an ever-changing task. Success will make a major difference in the quality of life worldwide. And the difference for the poor will be not only in

improving their quality of life but also, through increasing their productivity, in addressing one of the root causes of poverty. Global leadership and advocacy for health remain critical missing ingredients in the formula for making a difference and conveying evidence to the highest level of government. We need to remind Prime Ministers and Finance Ministers that they are health ministers themselves and that investments in the health of the poor can enhance growth and reduce poverty.

The report concludes that leadership must motivate and guide the technical community to bring today's powerful tools to bear on the challenges facing the world community [24].

Globalization, health and the environment

Globalization has become a modern day cargo cult. Over the last decade, a major international issue has been that of the impact of economic development and industrialization on the environment. This concern about our ecosystem culminated with another international talk-fest, The United Nations Conference on Environment and Development in Rio de Janeiro in 1992, and the resulting 'The Rio Declaration on Environment and Development'. The conference participants were particularly conscious of the much feared impact of global warming on the future of humanity.

The first of the 27 Principles enunciated in the Rio Declaration stated: 'Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature'. Yet this United Nations Conference did not address in any meaningful manner that behind globalization and its impact on the environment lies an untold story of devastating effects on the public and personal health for the people of developing nations and other economically disadvantaged groups. Amongst all of the environmental and economic hype in the ensuing years since the Rio conference, the plight of these communities has been conveniently ignored. It is not fashionable and has not been part of the global village agenda!

With important advances in public health and the discovery of antibiotics during the first half of the 20th century, as discussed earlier, it might have

been expected that there would be a dramatic improvement in the health and life expectancy of indigenous people as a result of prevention and control of the major communicable diseases [10]. Instead, a new health scourge consisting of non-communicable diseases has hit these communities as industrialization and the inevitable expansion of the multinational 'fast-food' chains bring Western foods of dubious nutritional value. The Western 'lifestyle diseases', noncommunicable diseases such as cancer, heart disease, hypertension and type 2 diabetes and their attendant morbidity and mortality are now epidemic [1, 8]. Globalization of the economies has accentuated and accelerated the process and its threat to the health of the most disadvantaged people in the world.

The real tragedy is that these health problems are linked to the socio-economic revolution and its impact on the traditional way of life including nutritional and physical activity patterns [8]. However, the solution to the epidemic, i.e. the prevention and control of these noncommunicable diseases is not in the hands of the medical community, but as stated by the WHO Report [24], with public and social planners, private enterprise, economists and politicians. Given the miserable record of implementation of a whole chain of international agreements and declarations, can we trust them to meet the challenge?

The global type 2 diabetes epidemic is one of the most obvious disease manifestation of a massive social and public health problem now facing developing countries as well the ethnic minorities and the disadvantaged in certain developed countries. Diabetes and its complications such as limb amputations, blindness and kidney failure are rife, imposing huge socio-cultural problems and an unanticipated and unacceptable economic burden [8].

The nutritional transition

Jared Diamond, the noted American biologist and author, suggested in a 1992 issue of *Nature* that the lifestyle-related diabetes epidemic in American Indians and Pacific islanders probably results from the collision of our old hunter-gatherer genes with the new 20th Century way of life [25]. The Western lifestyle must have unmasked the effects of pre-

existing genes because the consistent result has been diabetes within a few decades.

In these communities, the former dependency on hunting and gathering, and later subsistence agriculture was replaced with a modern pattern characterized by sedentary way of life and a diet of energy-dense, high saturated fat processed foods, usually exported from neighbouring and perhaps well-meaning developed nations. For example, Australia and New Zealand export consumable products rich in animal fats such as 'mutton flaps', 'turkey tails' and canned meats to the Pacific Islanders, foods that their own populations turn up their noses to!

Drewnowski & Popkin have discussed the concept of nutrition transition – the impact of globalization on the human diet [23]. They pointed out that analysis of economic and food availability data for 1962–94 reveals a major shift in composition of the global diet marked by an uncoupling of the classic relationship between income and fat intake. The increasing availability of cheap vegetable oils and fats has resulted in greatly increased fat consumption in low-income nations. They note that this trend means that the nutrition transition occurs at lower levels of gross national product. It is further accelerated by high rates of urbanization. They conclude that whilst economic development has led to improved food security and better health in some instances, there are adverse effects of the nutrition transition such as increased rates of childhood obesity. To this one would add the burden of the

noncommunicable diseases discussed earlier, each of which may be preceded or aggravated by obesity [26].

Type 2 diabetes and the pending cardiovascular disease epidemic

Type 2 diabetes has become epidemic with over 40% of the adults in some Pacific islands [3]. Diabetes is the condition at the tip of the iceberg representing the Metabolic Syndrome (Fig. 2), a cluster of coronary artery disease risk factors which includes abdominal obesity, hypertension and dyslipidaemia. It is also described as 'The New World Syndrome' or 'Deadly Quartet' [27]! This combination of risk factors is probably responsible for the increased risk of cardiovascular disease in people with diabetes. Attention has recently been drawn to the cardiovascular disease epidemic now being seen in many developing nations [28].

Premature morbidity and mortality from noncommunicable diseases

There is now a wealth of published reports of epidemiological studies highlighting the spectacularly high susceptibility of Micronesian, Polynesian, and certain Melanesian Pacific islanders, Australian Aborigines, North American Indians, Afro-American and other black populations, Hispanics, migrant Asian Indians and Chinese to type 2 diabetes [4].

Whilst type 2 diabetes in Europeans is usually

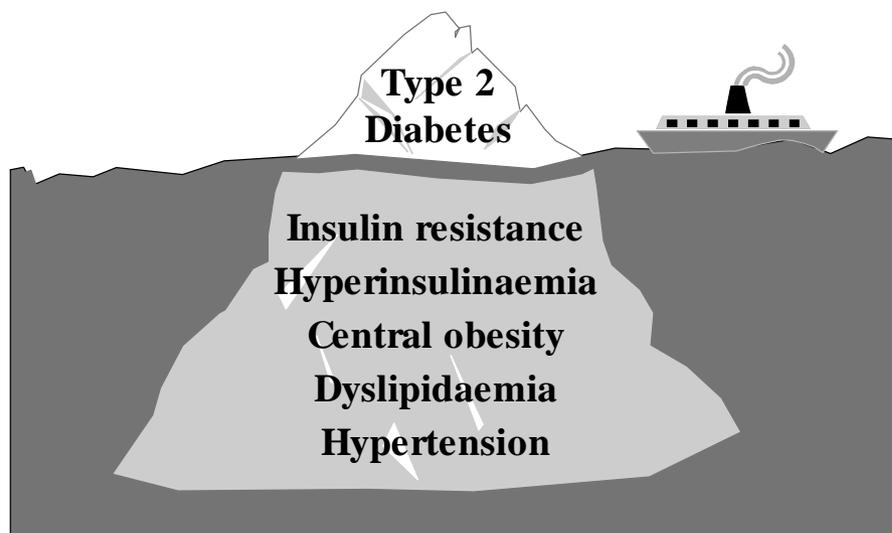


Fig. 2 The Metabolic Syndrome is synonymous to an iceberg with glucose intolerance above the surface but a group of other key cardiovascular disease risk factors lurking below.

characterized by onset after the age of 50, in Pacific islanders and these other high prevalence groups, onset in the 20–30 year age-group is increasingly seen [8]. The socio-economic and public health impact of this downward shift in disease onset on society is much greater through effects on the workforce and premature morbidity and mortality, not to mention the negative impact on fertility and reproduction.

Thrifty genes and the noncommunicable disease epidemic

The high genetic susceptibility to diabetes in these former traditional living groups has been attributed to an evolutionary phenomenon, namely a 'thrifty genotype', i.e. a gene or genes that favour survival in times of feast and famine [29]. In recent times, Barker and Hales have suggested that *in utero* factors leading to foetal malnutrition may be the cause of this chronic disease epidemic [30]. They discount any genetic influence. The intellectual battle between the proponents of the 'thrifty genotype' and 'thrifty phenotype' hypotheses has become the highlight of many international scientific meetings.

Whilst it is clear that the association between low birth weight infants and subsequent noncommunicable diseases risk is a true phenomenon, the explanation it is not so simple. There are now strong arguments against an exclusive environmental role and it is likely that genes are implicated as well [31].

The impact of noncommunicable diseases on populations – can it be reduced?

Coupled with cigarette smoking and alcohol abuse, the main constituents of 'The New World Syndrome' including hypertension, obesity and dyslipidaemia, and type 2 diabetes with its devastating macrovascular and microvascular complications are causing havoc [1, 27]. Their socio-economic cost through family disruption, loss to the workforce and premature mortality, coupled with the public health burden on primary, secondary and tertiary health care services in poor nations, is extracting a high economic toll.

The international communities' response has been to address the noncommunicable diseases epidemic with a traditional 'medical' model ap-

proach to prevention. However, what is needed is the realization that the problems which international agencies and governments approach as diseases, with traditional prevention and control measures, are actually symptoms of a much larger global socio-economic and demographic problem. Here is a new social and health paradigm for the international community to address.

The world community has been very laggard with its reaction to the problem of the noncommunicable diseases epidemic and the urgent need to address the prevention issues. This has been further complicated by the re-emergence of devastating communicable diseases such as AIDS, the Ebola virus and that old enemy, tuberculosis [19, 20]. The noncommunicable diseases explosion will not be prevented by diet and exercise alone! What is required are major and dramatic changes in the socio-economic and cultural status of people in developing countries and disadvantaged and minority groups in developed nations.

An outstanding example of the linkage of health to the socio-economic and cultural values of a community is that of the Australian Aboriginal and Torres Strait Island people [32]. These diseases and particularly type 2 diabetes and its eye and renal complications are decimating their health. However, it is now understood that the solution to this unfortunate scenario does not lie with hypoglycaemic agents, retinal photocoagulation and renal dialysis. There is an urgent need for a radical improvement in their social, cultural and economic status that would ultimately bring them onto the same level as the European community whilst retaining their self-esteem and dignity, land rights and unique status as the original inhabitants of Terra Australis Incognita. The same scenario applies equally to the American and Canadian native people [4, 5].

Who will take the responsibility of addressing this new paradigm and establishing the priorities? The battle needs to be directed against the tide of global socio-economic forces that have seen the underprivileged nations and people going backwards whilst the developed nations and their high and middle-income groups enjoy unprecedented economic growth. Where are the spokespersons, the champions for the indigenous people of our world and their cause? We have the passionate environmental antinuclear lobbies, the animal antivivisection-

tionists, to name but a few, but who will champion the health issues arising from globalization?

There are some encouraging signs that the World Bank [19] is now addressing these issues along with WHO. The WHO Report 1999 warns that non-communicable diseases are likely to account for an increasing share of disease burden – rising from 55% in 1990 to 73% by the year 2020 [24]. It states that health systems will have to be adjusted to cope effectively and efficiently with this global shift in the nature of disease. The increase is expected to be particularly rapid in developing countries. In India, for example, deaths from noncommunicable diseases are projected to almost double from about 4 million to about 8 million a year.

The medical community took leadership in the antinuclear movement. Now is the time to show that the health community is socially responsive and responsible. WHO, UNDP, UNICEF, the World Bank and other international and regional agencies involved in the global social, health, nutritional and welfare arena must move forward on an integrated approach to a symptom, not the disease. The establishment of a multidisciplinary International Task Force representing all agencies and parties which can contribute to a reversal of the underlying socio-economic causes of the noncommunicable diseases epidemic is an urgent priority.

Drewnowski & Popkin note that it is not too late for developing nations to develop policies for education and intervention, promoting a healthy diet [23]. This might involve legislative changes that involve taxation and import tariffs as well as consumer education, all directed to reduce the adverse effects of nutritional transition.

We have estimated that the present approxi-

mately 110 million people with diabetes in the world will reach around 220 million by the year 2010, the majority of them having type 2 diabetes [16]. Thus there is an urgent need for strategies to prevent the emerging global epidemic of type 2 diabetes to be implemented. The big question is whether anybody really cares?

Biopiracy – an important ethical issue that requires attention

The epidemic of Western lifestyle diseases in indigenous people raises another important issue. New research opportunities have been created to investigate the genetic and environmental causes of the diseases plaguing developed nations. There is huge potential to exploit developing nations and their indigenous people through biopiracy. The explosion of human genome research and its great potential for advances in disease screening and therapy [33] has created some important ethical issues which must be addressed urgently. The noncommunicable diseases epidemic has caused us to look more seriously at the genetic, environmental, socio-economic and cultural issues contributing to the epidemic. This highlights the role of scientists not only as data collectors and interpreters but also as social advocates.

Biopiracy from 'hit and run' research teams can lead to exploitation of these communities through the collection of biological specimens without the return of any benefits to the indigenous communities involved. A high priority is to develop ethical and contractual agreements that protect their rights, both social and economic.

An encouraging initiative in this area is the recent

Table 1 Global estimates of diabetes from 1995 to 2010 (in thousands) [2]

Region	1995				2000			2010		
	Population	Type 1	Type 2	Total	Type 1	Type 2	Total	Type 1	Type 2	Total
World	5697 038	3539	114 878	118 417	4423	146 804	151 227	5446	215 272	220 718
Africa	731 470	85	7 209	7 294	142	9 270	9 412	219	13 933	14 152
Asia	3437 786	1030	61 752	62 782	1608	82 902	84 510	2241	130 056	132 297
North America	296 517	879	12 098	12 977	1019	13 174	14 193	1175	16 360	17 535
Latin America	475 704	309	12 094	12 403	389	15 177	15 566	479	22 062	22 541
Europe	727 787	1155	20 885	22 040	1182	25 325	26 507	1245	31 620	32 865
Oceania	27 774	81	840	921	83	956	1 039	87	1 241	1 328

publication by UNESCO of a draft of 'A Universal Declaration on the Human Genome and Human Rights'. This review is a plea for a wider recognition of how the global community as a totality, and indeed every international agency and developed nation, as well as key academic institutions and pharmaceutical and biotechnology companies must become more effective members of the 'global village'. The indigenous people of the world are as precious as our environment and deserve the same degree of concern and protection. Unless the leaders of developed nations pay attention to the coming noncommunicable diseases disaster then the socio-economic and health gap between the rich and poor will continue to be a widening chasm!

Conclusions

The magnitude of the diabetes epidemic in Asia, the Pacific and other regions of the world, coupled with the significant morbidity and mortality due to the enormous burden associated with diabetic complications heralds the need for increased attention and resources. The fact that the three most potent environmental risk factors currently recognized are modifiable, points to lifestyle intervention, with the incorporation of a healthy diet and an increase in physical activity, as a means of curbing the impact of this epidemic [1, 8]. An integration of lifestyles, new and old, poses a difficult challenge but is essential to optimize health for all.

It is fitting that the last words of this review be left to the newly appointed Director General of WHO. 'The World Health Report 1999: Making a Difference' [24] was published on the opening day of the World Health Assembly in Geneva. It was the first issued since Dr Gro Harlem Brundtland took office. In her introduction, she stated:

The world could end the first decade of the 21st century with notable accomplishments. Most of the world's poor people would no longer suffer today's burden of premature death and excessive disability, and poverty itself would thereby be much reduced. Healthy life expectancy would increase for all. Smoking and other risks to health would fade in significance. The financial burdens of medical needs would be more fairly shared, leaving no household without access to care or exposed to economic ruin as a result of health

expenditure. And health systems would respond with greater compassion, quality and efficiency to the increasingly diverse demands they face.

Dr Brundtland has thrown down the challenge to our world political leaders. It now remains to see if they can rise to the challenge.

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