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# The Growing Diabetes Pandemic

## One Million Deaths Globally Every Year

Diabetes is a metabolic disease that results from defects in the secretion or activity of insulin within a person's body. Diabetes has many potential health complications, including coronary heart disease, stroke, peripheral vascular disease, blindness, kidney disease, and lower-extremity amputation. There are three basic types of diabetes. Type 1 diabetes, which most often strikes children and young adults, occurs when the destruction of pancreatic cells causes insulin deficiency. Type 2 diabetes, which accounts for 85 percent to 95 percent of all cases, is usually characterized by insulin resistance when the body no longer uses insulin properly. A third type is gestational diabetes, which appears only during pregnancy.

### Burden of Disease

In 2003, diabetes prevalence worldwide was estimated at 5.1 percent among people ages 20 to 79. Although diabetes is still more common in developed countries, it is rapidly increasing in developing countries. By 2025, the worldwide prevalence is projected to be 6.3 percent, a 24-percent increase over the 2003 rate, largely due to greater food availability and increased consumption of sugar and fats.

Diabetes causes significant morbidity and mortality. The World Health Organization (WHO) estimates that 1 million deaths were caused by diabetes in 2001. Almost two-thirds of these deaths occurred in developing countries, where four-fifths of the world population lives. The death rate for men with diabetes is almost twice that of men without it. For women with the disease, the death rate is two and a half times higher than that of women without diabetes. Diabetes is a major risk factor for cardiovascular disease (CVD), which causes up to 65 percent of all deaths of people with diabetes in developed countries.

More than 80 percent of the global disability adjusted life years (DALYs) in 2001 resulting from diabetes were in developing countries, with the largest burden in East Asia and the Pacific. Between 1990 and 2001, the proportion of DALYs resulting from diabetes increased by 250 percent worldwide, and by 266 percent in low- and middle-income countries.

The economic burden of diabetes is felt acutely by national health care systems, which incur most of the treatment costs, and by individuals and families, who suffer indirect costs from lost productivity caused by sickness, disability, and premature death from the disease. The direct health care costs of diabetes range from 2.5 percent to 15.0 percent of the annual health care budgets in developing countries. But the indirect costs are even higher, and, because diabetes is projected to increase most among people in their productive years (ages 20 to 64) over the next 30 years, the future indirect costs will be even higher.

### Risk Factors

The risk factors for type 2 diabetes include obesity, physical inactivity, pregnancy, improper diet, and certain socioeconomic characteristics. The risks begin before birth: Retarded intrauterine growth and low birth weight increase the risk of developing diabetes. After birth, however, breastfeeding reduces the risk of developing obesity, insulin resistance, and diabetes.

Obesity and weight gain are key risk factors for diabetes. Both are caused by a disproportionate intake of energy as food compared with the amount of energy expended through physical exercise. Each unit increase in the body mass index, a common measure of body weight, boosts the risk of diabetes by 12 percent. Central obesity, or disproportionate build-up of fat in the body's trunk region, is

another leading risk factor, as is a sedentary lifestyle. Diet plays a strong role—a high intake of sugar-sweetened beverages, saturated fats, and trans fatty acids increases the risk of diabetes. In contrast, regular physical activity and diets including polyunsaturated fats, long-chain omega-3 fatty acids (found in fish oils) and rich in fiber and vegetables may reduce the risk of diabetes.

Likewise, socioeconomic status appears to influence the risk of developing diabetes, but the relationship operates differently in developed than in developing countries. In developing economies, diabetes is linked to increased affluence and Westernization, especially among indigenous populations. But in developed countries, people in lower socioeconomic groups have a higher risk of obesity and type 2 diabetes.

## Cost-Effective Interventions

Efforts to prevent type 2 diabetes involve lifestyle interventions—changes in diet and increased physical activity among people at high risk—and medications. Lifestyle interventions reduced the incidence of type 2 diabetes by almost 60 percent in a major study. Other interventions include screening to detect diabetes in its early stages, and managing the disease to reduce its complications. There is not enough evidence to show that type 1 diabetes can be prevented.

Three interventions have proven especially cost-effective and feasible in low-resource settings. The first involves glycemic control through diet and physical activity, oral medications to reduce glucose, and insulin injections, combined with patient education to foster compliance with medication and diet and exercise regimens (see table). Glucose is usually poorly controlled among people with diabetes in developing countries because of lack of access to insulin and other diabetes treatment supplies. Hence, an important aspect of these interventions in developing countries is to guarantee these supplies.

A second highly cost-effective and feasible intervention is the use of medication to control blood pressure. Even in the United States, moderate blood-pressure control costs less than US\$250 per patient per year, with even lower costs in developing countries because most of the drugs are generic and therefore less expensive.

A third cost-effective intervention is low-cost foot care to reduce the risk of foot ulceration and amputation. Foot-care

education programs for health care professionals and patients can cover foot hygiene, treatment of calluses, awareness of functional infections, care for skin injuries, and access to appropriate footwear.

Other diabetes interventions that provide good value for money in some settings may not be feasible in others, depending on the resources needed, the difficulty in reaching the target population, the expertise required, or a country's ability to deliver the intervention within its health care system. Proven interventions include care for women of reproductive age before they become pregnant; lifestyle interventions; influenza vaccinations; annual eye examinations; smoking cessation programs; and blood pressure control through medication.

Other interventions that would not be cost-effective or feasible in many low-resource settings include specific high-cost drugs, cholesterol and/or intensive glucose control, and screening for undiagnosed diabetes.

A polypill—a combination pill that includes three or four drugs that combat hypertension and elevated cholesterol—might become available that would reduce the risk of cardiovascular disease among people with diabetes. Although the benefits and side effects of a polypill have yet to be established, computer modeling suggests cost-effectiveness from US\$560 to US\$1,280 per quality adjusted life year (QALY) gained.

Diabetes education is an integral part of diabetes care because it helps people with diabetes learn about and understand their disease, recognize emergency health problems, and adhere to self-care practices and lifestyle changes. A review of literature suggests that self-managed diabetes education may reduce medical costs in developing countries. A study in Latin America showed that a low-cost education program reduced the cost of drugs by 62 percent.

The quality of diabetes care generally remains poor worldwide, regardless of a country's level of development, health care system, or population size. Yet, the growing diabetes pandemic warrants greater attention and rapid action. An array of effective interventions to prevent diabetes and its complications is available, with varying degrees of implementation feasibility. Diabetes education and organized care delivery are perhaps the most essential interventions today: It reaps substantial benefits at a low cost. Over the long-term, other interventions such as the polypill, that have yet to be proven, may be the most cost-effective way to address this pandemic.

## Key Cost-Effective Interventions for Preventing and Treating Diabetes and Its Complications

INTERVENTION	DESCRIPTION	FEASIBILITY <sup>c</sup>
<b>LEVEL 1<sup>a</sup></b>		
Glycemic control in people with poor control	Insulin, oral glucose-lowering agents, diet, and exercise	• • • •
Blood pressure control	Blood pressure control medications	• • • •
Foot care	Patient and provider education, foot examination, foot hygiene, and appropriate footwear	• • • •
<b>LEVEL 2<sup>b</sup></b>		
Care for women of reproductive age before they become pregnant	Patient self-management	• •
Lifestyle intervention to prevent diabetes	Behavioral change, including diet and physical activity, to reduce bodyweight	• •
Influenza vaccination	Vaccination	• • • •
Detection and treatment of eye diseases	Eye examination to screen for and treat eye diseases	• •
ACE inhibitors	Angiotensin-converting enzyme medication	• •
Smoking cessation	Physician counseling and nicotine replacement therapy	• • •
a. Level 1 interventions are cost saving and highly feasible.		
b. Level 2 interventions are cost saving or cost less than US\$1,500 per quality-adjusted life year but pose feasibility challenges.		
c. Feasibility was assessed based on difficulty of reaching the intervention population (the capacity of the health care system to deliver an intervention to the targeted population), technical complexity (the level of medical technologies or expertise needed for implementing an intervention), capital intensity (the amount of capital required for an intervention), and cultural acceptability (appropriateness of an intervention in terms of social norms and/or religious beliefs). •••• indicates feasible for all four aspects, ••• indicates feasible for three of the four, •• indicates feasible for two of the four, and • indicates feasible for one of the four.		

Source: K. M. Venkat Narayan et al. 2006. "Diabetes: The Pandemic and Potential Solutions." In *Disease Control Priorities in Development Countries*, 2nd ed. D. T. Jamison, J. G. Breman, A. G. Measham, G. Alleyne, M. Claeson, D. B. Evans, P. Jha, A. Mills, and P. Musgrove. tables 30.3 and 30.4. New York: Oxford University Press.

## References

K.M. Venkat Narayan et al. 2006. "Diabetes: The Pandemic and Potential Solutions." *In Disease Control Priorities in Development Countries*, 2nd ed. D. T. Jamison, J. G. Breman, A. G. Measham, G. Alleyne, M. Claeson, D. B. Evans, P. Jha, A. Mills, and P. Musgrove, 591-603. New York: Oxford University Press.