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POPULATION AND INDIVIDUAL APPROACHES TO THE PREVENTION AND MANAGEMENT OF DIABETES AND OBESITY

Introduction

1. Obesity and diabetes are affecting the peoples of the Americas at high and increasing rates. National surveys demonstrate that obesity is increasing in prevalence among all age groups; 7% to 12% of children under 5 years old and one-fifth of adolescents are obese,[1] while rates of overweight and obesity among adults approach 60%.[2,3,4] Obesity is the major modifiable risk factor for diabetes.[5] The estimated number of people with diabetes in Latin America is expected to increase by more than 50%, from 13.3 million in 2000 to 32.9 million by 2030.[6] Diabetes and obesity are no longer

[1] Pan American Health Organization. The WHO Global Strategy on Diet, Physical Activity and Health (DPAS), Implementation Plan for Latin America and the Caribbean 2006-2007. (Unpublished document); 2006.

[2] Belize, Ministry of Health; Pan American Health Organization. Central American Diabetes Initiative (CAMDI). Survey of Diabetes, Hypertension, and Chronic Disease Risk Factors, Belize City, Belize. Washington, DC: PAHO/WHO; 2007 (In press).

[3] Nicaragua, Ministerio de Salud; Pan American Health Organization. Central American Diabetes Initiative (CAMDI). Survey of Diabetes, Hypertension, and Chronic Disease Risk Factors, Managua, Nicaragua. Washington, DC: PAHO/WHO; 2007 (In press).

[4] El Salvador, Ministry of Public Health; Pan American Health Organization. Central American Diabetes Initiative (CAMDI). Survey of Diabetes, Hypertension, and Chronic Disease Risk Factors, Santa Tecla, El Salvador. Washington, DC: PAHO/WHO; 2007 (In press).

[5] Astrup A, Finer N. Redefining type 2 diabetes: "diabesity" or "obesity dependent diabetes mellitus"? Obes Rev 2000;1:57–59.

[6] Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes. Estimates for the year 2000 and projections for 2030. Diabetes Care 2004;27(5):1047–1053.

"diseases of affluence," and disproportionately affect the poor[7] and the less educated of the Region.[8,9] In 2006, Ministers of Health throughout the Americas adopted the Regional Strategy and Plan of Action on an Integrated Approach to the Prevention and Control of Chronic Diseases, including Diet, Physical Activity, and Health (CD47/17, Rev. 1). Given the upward trend in cases of obesity and diabetes in the Americas and armed with the evidence that cost-effective interventions to prevent and manage these conditions exist, the time to prioritize implementation of these actions is now.

Background

2. Overweight in adults is defined as body mass index (BMI) between 25 kg/m^2 and 29.9 Kg/m^2 and obesity as BMI above 30 Kg/m^2. Research has demonstrated a strong and consistent link between obesity and diabetes; increases in BMI are associated with increased risk for diabetes[10,11] and abdominal obesity has emerged as a strong predictor of diabetes.[12]

3. Diabetes Mellitus is a chronic metabolic disease characterized by elevated blood glucose (hyperglycemia). It is associated with an absolute or relative deficiency in the secretion and/or action of insulin.[13] There are three main forms of diabetes: type 1, type 2, and gestational diabetes. Type 2 diabetes is the most common and accounts for approximately 85% to 90% of all cases. It is related to modifiable risk factors such as obesity or overweight, physical inactivity, and high-calorie diets of low nutritional value. Intermediate hyperglycemia, often called prediabetes, is a component of the metabolic syndrome, which is characterized by the presence of prediabetes in conjunction with one other cardiovascular disease (CVD) risk factor (hypertension, upper body obesity or

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[7] World Health Organization. Preventing Chronic Disease. A Vital Investment. Geneva: World Health Organization; 2005.

[8] Ragoobirsingh D, Lewis-Fuller E, Morrison E Y St. A. The Jamaican Diabetes Study. A Protocol for the Caribbean. Diabetes Care 1995;18(9):1277-1282.

[9] Barceló A, Peláez M, Rodriguez-Wong L, Pastor-Valero M. The prevalence of diagnosed diabetes among the elderly of seven cities in Latin America and the Caribbean. J Aging Health 2006;18(2): 224–239.

[10] Ford ES, Williamson DH, Liu S. Weight change and diabetes incidence: findings from a national cohort of US adults. American Journal of Epidemiology 1997;146(3):214-222.

[11] Resnich HE, Valsania P, Halter JB, Lin X. Relation of weight gain and weight loss onsubsequent diabetes risk in overweight adults. J Epidemiol Community Health 2000; 54:596–602.

[12] Meisinger C, Döring A, Thorand B, Heier M, Löwel H. Body fat distribution and risk of type 2 diabetes in the general population: are there differences between men and women? The MONICA/KORA Augsburg Cohort Study. Am J Clin Nutr 2006; 84: 483–489.

[13] World Health Organization. The Prevention of Diabetes Mellitus and Its Complications. Geneva: World Health Organization; 2008 (in press).

dyslipidemia). Recent estimates reveal that among Latin American and Caribbean countries, the highest prevalence of diabetes has been reported in Belize (12.4%) and Mexico (10.7%)[14] with rates of 8% to10% in Managua, Guatemala City,[15] and Bogota.[16] The most recent data from the United States[17,18,19] reported a prevalence of diabetes of 9.3% while it was 15.7% along the US-Mexico border.[20]

4. The burden that diabetes presents to society and to the individual is chiefly associated with increased disability and premature mortality due to complications. Diabetes complications and premature mortality are believed to be exacerbated by poor quality of care. The risk of dying from cardiovascular disease (CVD) and all causes is between two and three times higher among people with diabetes than among their peers without diabetes.[21,22] After a 20 year duration of diabetes, the frequency of chronic complications in clinical settings of six Latin American[23] countries were found to be 48% for retinopathy, 6.7% for blindness, 42% for neuropathy, 1.5% for kidney damage, 6.7% for myocardial infarction (heart attack), 3.3% for stroke and 7.3% for lower limb amputations. Some population groups are at particular risk for complications. For example, studies in Barbados demonstrated a high incidence of lower limb amputations

[14] Velazquez-Monroy O, Rosas Peralta M, Lara Esqueda A, Pastelin Hernandez G, Sanchez-Castillo C, Attie F, et al. Prevalence and interrelations of noncommunicable chronic diseases and cardiovascular risk factors in Mexico. Final outcomes from the National Health Survey 2000. Arch Cardiol Mex 2003; 73(1): 62–77.

[15] Guatemala, Ministerio de Salud; Pan American Health Organization. Central American Diabetes Initiative (CAMDI). Survey of Diabetes, Hypertension, and Chronic Disease Risk Factors, Villanueva, Guatemala. Washington, DC: PAHO/ WHO; 2007.

[16] Schargrodsky H, Hernandez-Hernandez R, Marcet Champagne B, Silva H, Vinueza R, Silva Ayçaguer LC, et al. for the CARMELA Study Investigators. CARMELA: Assessment of Cardiovascular Risk in Seven Latin American Cities. The American Journal of Medicine 2008;121(1):58-65.

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[19] Ogden CL, Carroll MD, Curtin LR, McDowell MA, et al. Prevalence of overweight and obesity in the United States, 1999–2004. JAMA 2006; 295(13):1549–1555.

[20] Pan American Health Organization. The U.S.-Mexico border diabetes prevention and control project. First report of results. Available from: http://www.fep.paho.org/english/publicaciones/Diabetes/Diabetes%20first%20report%20of %20.Results.pdf. Accessed 21 February 2007.

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(936 per 10^5) and a prevalence of retinopathy of 28.5% among blacks.[24,25] The cost of health care for people affected by diabetes is between two and three times higher than among peers without diabetes.[26] In 2000, the cost of diabetes in the Region was estimated at US$ 65.2 billion, of which $10.7 billion were direct costs and $54.5 billion, indirect costs.[27,28] In 2006, the cost of diabetes in some countries was reported between 0.4% and 2.3% of GDP.[29] While diabetes and its complications are largely preventable, lack of access to quality health care services and lack of knowledge of preventive measures are widespread.

5. The obesity epidemic, which is behind the rise in diabetes, is largely driven by the twin trends of changing dietary patterns and decreasing physical activity. Most countries in the Americas are experiencing a shift in dietary patterns toward increased consumption of energy-dense foods, rich in saturated fat, sugars, and salt. This pattern, coupled with the fact that 30 to 60% of the population does not meet minimum recommended levels of physical activity (e.g., 30 minutes walking per day) contribute in large part to the high rates of overweight and obesity in the Region. Transitions in the environment, rather than declines in knowledge or self-efficacy, are the major contributors to the aforementioned changes in diet and physical activity patterns.[30,31] A combination of government policies, regional and global market forces, inadequate response to changing demographic patterns, technological advances that precipitate behavior and lifestyle changes, and lack of awareness and action by civil society are key factors leading to the rising epidemics of obesity and diabetes. However, the strong social and environmental determinants of

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overweight, obesity, and ill health present an apt area for intervention in which an evidence-base exists to guide action.

6. In many countries, obesity and diabetes affect women disproportionately. Gestational diabetes in particular has detrimental consequences for mother and child, increasing the frequency of perinatal morbidity and mortality. In addition, maternal obesity and diabetes have been linked to increased susceptibility for the child to develop diabetes during youth, creating a vicious circle where obesity and diabetes beget more diabetes.[32] Diabetes also has effects on other health conditions; because it impairs immunity, diabetes has been associated with tuberculosis. This association has potential public health implications given the growing epidemic of diabetes.[33,34] The relationship among diabetes, maternal and newborn morbidity and tuberculosis may have a negative impact on the achievement of the related Millennium Development Goals in many countries of the Region. Furthermore, low birth weight is associated with an increased risk for type 2 diabetes during adulthood.[35,36] This is an element that may exacerbate the diabetes epidemic in low and middle income countries still struggling with high frequency of low birth weight.

7. The international community recognized the problem of chronic diseases and set the stage with the WHO Global Strategy for the Prevention and Control of Chronic Diseases (WHA53.17, 2000), The Framework Convention for Tobacco Control (WHA56.1, 2003), the Global Strategy on Diet, Physical Activity and Health (WHA57.17, 2004) and most recently, the aforementioned Regional Strategy on Chronic Diseases (CD47/17, Rev.1). The United Nations General Assembly recognized the burden of diabetes by adopting a resolution in December 2006 designating World Diabetes Day as a United Nations Day (A/RES/61/225). Over ten years ago, PAHO's Directing Council adopted the Declaration of the Americas on Diabetes (DOTA)[37] a

[32] Dabelea D, Mayer-Davis EJ, Lamichhane AP, D'Agostino RB Jr, Liese AD, Vehik KS,Venkat Narayan KM, Zeitler P, Hamman RF. Association of Intrauterine Exposure to Maternal Diabetes and Obesity with Type 2 Diabetes in Youth: The SEARCH Case-Control Study. Diabetes Care [Epub ahead of print]; 2008

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[34] Stevenson CR, Critchley JA, Forouhi NG, Roglic G, Williams BG, Dye C, Unwin NC. Diabetes and the risk of tuberculosis: a neglected threat to public health? Chronic Illness 2007; 3(3):228-245.

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landmark document calling for actions to prevent and improve the management of diabetes in conjunction with civil society. Since then, PAHO has collaborated with Central America, the Caribbean, South America and the US-Mexico border in the area of obesity and diabetes, strengthening capacity for surveillance, conducting public awareness campaigns, facilitating quality improvement strategies for chronic care, and creating task forces for specific issues, among other activities. The current proposal prioritizes results-oriented actions that Member States can take, even in resource-constrained settings, to address the challenges of obesity and diabetes.

Analysis: Interventions for the prevention and management of obesity and diabetes

8. Prevention and management strategies are crucial to turning back the tide on obesity and diabetes. Evidence demonstrates that risks of chronic disease begin in the uterus and continue into old age.[38] Therefore, strategies to address the problem at all stages of the life cycle are important, including paying particular attention to obesity and diabetes in women of reproductive age. The frequency of medical care and health expenditures increase notably among those with diabetes as early as eight years before clinical onset.[39] This means that people at the highest risk for type 2 diabetes are in contact with the health system and can be identified. People with prediabetes have shown an increased risk for diabetes and CVD. Diabetes screening facilities are the opportune identification of such at-risk individuals, or those in the early stages of obesity and diabetes, when non-pharmacological treatment may still be a preferred option. Studies have demonstrated that approximately one-third of people with type 2 diabetes are undiagnosed, and already present complications at the time of diagnosis.

9. Two approaches need to be used to implement prevention strategies: the population-based approach and the individual, high-risk approach. The population-based approach focuses largely on health promotion activities and actions that influence the environment (i.e., physical, social, economic and regulatory). For example, it has been calculated that replacing 2% of the energy from trans fat with polyunsaturated fat would reduce the incidence of type 2 diabetes by 40%.[40] Research has also demonstrated that

[38] World Health Organization. Diet, Nutrition, and the Prevention of Chronic Disease. Report of a Joint WHO/FAO Consultation. WHO Technical Report Series 916. World Health Organization: Geneva; 2003.

[39] Nichols GA, Glauber HS, Brown JB. Type 2 diabetes: incremental medical care costs during the first 8 years after diagnosis. Diabetes Care 2001;23(11):1660-1665.

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metropolitan public transport systems designed to coordinate with pedestrian walkways or bike paths facilitate the practice of daily physical activity.[41]

10. The individual approach focuses on high-risk or affected individuals through direct interventions. For primary prevention of obesity and diabetes, the individual approach is based on the replication of randomized trials such as the Diabetes Prevention Program[42] (DPP), the Finland Diabetes Program[43] and the Da Qin Study,[44,45] which demonstrated that an intensive lifestyle intervention was successful in achieving weight reduction and preventing or delaying the onset of type 2 diabetes in at-risk individuals. Secondary prevention strategies are aimed at decreasing mortality and the prevalence of chronic complications in those who have been diagnosed with diabetes. Data that demonstrate the strength of secondary prevention strategies are widely available. For example, the UK Prospective Diabetes Study indicated that tight blood pressure control in people with type 2 diabetes reduced the risk of developing any end point related to diabetes by 24%.[46]

11. The population and individual approaches are complementary and function best when combined in an integrated manner. Recommended actions for primary and secondary prevention of obesity and diabetes at both levels are found in Table 1. The choice is clear and inaction too risky; it is opportune to prioritize such strategies in the Region.

Proposal for the prevention and management of diabetes and obesity in the Americas

12. The following approaches are presented along five strategic areas which form the foundation for action to address obesity and diabetes in the Region. These strategies need

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[41] Jacoby ER, Motezuma R, Rice M, Malo M, Crespo C. Transportation, Urban development, and public safety in Latin America: Their importance to public health and an active lifestyle. In Nutrition and an active life, From knowledge to action. Scientific and technical publication No. 612. Washington DC: Pan American Health Organization; 2005.

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[43] Laaksonen DE, Lindstrom J, Lakka TA, Eriksson JG, Niskanen L, Wikstrom K, et al. Physical activity in the prevention of type 2 diabetes: the Finnish diabetes prevention study. Diabetes. 2005;54:158-165.

[44] Pan XR, Li GW, Hu YH, Wang JX, Yang WY, An ZX, et al. Effects of diet and exercise in preventing NIDDM in people with impaired glucose tolerance. The Da Qing IGT and Diabetes Study. Diabetes Care 1997;20: 537-544.

[45] Li G. Annual Meeting of the American Diabetes Association. Abstract Book. In press; 2008.

[46] UK Prospective Diabetes Study Group. Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes: UKPDS 38. BMJ 1998;317:703–713.

to be complemented with appropriate mechanisms of financing and policy development to ensure access to care and the necessary resources to address the twin epidemics of obesity and diabetes.

Primary prevention of obesity and diabetes

Population approach

13. Primary prevention at the population level through activities such as health promotion, creation of healthy public policies focused on food, diet and physical activity, and creation of healthy environments. Key actions include fiscal/policy incentives for production and consumption of healthy foods, guidelines to regulate the marketing and sale of foods to children, wide promotion of fruit and vegetable consumption, the elimination of trans fats in processed foods, workplace wellness initiatives, physical education curricula and healthy feeding programs in schools, urban planning that encourages walking and biking, improved access to recreation and sports through partnerships, and massive education campaigns.

Individual approach

14. Creation and implementation of guidelines for the prevention of obesity and diabetes in primary health care, including meal and exercise plans, or medication if required.

Screening for diabetes and prediabetes including identification of overweight or obesity

Individual approach

15. Identification of people at risk for diabetes (with two or more risk factors for type 2 diabetes (such as a family history of diabetes, high blood pressure, a history of hyperglycemia or gestational diabetes, or overweight) when preventive services are available and enroll those at risk in weight reduction programs or in courses of care for the management of obesity and diabetes.

Improving management of obesity and diabetes

Population approach

16. Standards for care and management of obesity and diabetes should be developed and implemented at the primary care level. The chronic care model is a framework to identify gaps in care with the aim of designing strategies for quality improvement. Adoption of this model at the national level can facilitate improved management. Additionally, the list of essential medicines should include those that are necessary for the management of diabetes, including insulin, metformin and glibenclamide. In settings

with more resources available for health, access to medications for lipid and blood pressure reduction and certain diagnostic and treatment procedures are strongly encouraged.

Individual approach

17. The creation of community services within the civil society can provide additional support to people with obesity and diabetes.

Secondary prevention of complications

Population approach

18. Strategies include patient and provider education, efforts aimed at smoking cessation, increased physical activity, and healthy eating.

Individual approach

19. A number of clinically proven strategies are available for the secondary prevention of complications.

- CVD: blood sugar control,[47] blood pressure control, smoking cessation,[48,49] aspirin treatment,[50,51] lipid reduction treatment,[52,53,54,55,56] rennin-angiotensin system (RAS) inhibitors;[57]

[47] Stratton IM, Adler AI, Neil HA, Matthews DR, Manley SE, Cull CA, et al. Association of glycaemia with macrovascular and microvascular complications of type 2 diabetes (UKPDS 35): prospective observational study. BMJ. 2000;321:405-12.

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[49] Manson JE, Colditz GA, Stampfer MJ, Willett WC, Krolewski AS, Rosner B, et al. A prospective study of maturity-onset diabetes mellitus and risk of coronary heart disease and stroke in women. Archives of Internal Medicine. 1991;151:1141-7.

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- Nephropathy (Kidney damage): blood sugar control, blood pressure control, and medications including RAS inhibitors [58,59] angiotensin receptor blocker (ARB, and angiotensin converting enzyme (ACE);[60]
- Retinopathy: blood sugar control,[61,62] blood pressure control,[46,63] lipid reduction treatment;[64]

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[53] Soedamah-Muthu SS, Colhoun HM, Thomason MJ, Betteridge DJ, Durrington PN, Hitman GA, et al. The effect of atorvastatin on serum lipids, lipoproteins and NMR spectroscopy defined lipoprotein subclasses in type 2 diabetic patients with ischaemic heart disease. Atherosclerosis. 2003;167:243-55.

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[58] Parving HH, Lehnert H, Brochner-Mortensen J, Gomis R, Andersen S, Arner P, et al. The effect of irbesartan on the development of diabetic nephropathy in patients with type 2 diabetes. New England Journal of Medicine. 2001;345:870-8.

[59] Lewis EJ, Hunsicker LG, Clarke WR, Berl T, Pohl MA, Lewis JB, et al. Renoprotective effect of the angiotensin-receptor antagonist irbesartan in patients with nephropathy due to type 2 diabetes.. New England Journal of Medicine. 2001;345:851-60.

[60] Lewis EJ, Hunsicker LG, Bain RP, Rohde RD. The effect of angiotensin-converting-enzyme inhibition on diabetic nephropathy. The Collaborative Study Group. New England Journal of Medicine. 1993;329:1456-62.

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[63] Matthews DR, Stratton IM, Aldington SJ, Holman RR, Kohner EM, Group UKPDS. Risks of progression of retinopathy and vision loss related to tight blood pressure control in type 2 diabetes mellitus: UKPDS 69. Archives of Ophthalmology. 2004;122:1631-40.

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- Blindness: annual eye examinations, and prompt treatment of problems in order to minimize visual loss;[65,66] this includes panretinal laser surgery for eyes with advanced proliferative retinopathy, and focal laser photocoagulation for eyes with clinically significant vision-threatening macular edema;

- Amputations: foot care education.[67]

Surveillance and monitoring

Population approach

20. Various sources of information can be used for the surveillance of diabetes and obesity in populations, including periodical population-based surveys, health service statistics, school-based surveys and routinely collected vital statistics. Several countries of the Americas are currently monitoring risk factors for chronic disease using the Pan American STEPS methodology, which is a simple, standardized method for collecting, analyzing, and disseminating risk factor data.

Action by the Executive Committee

21. Based on the information presented in this document, the Executive Committee is invited to analyze the population and individual approaches to prevention and management of obesity and diabetes, encourage Member States to prioritize the proposed strategies, and review and forward the draft Resolution to the Directing Council.

Annex

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Table 1. Interventions for Prevention and Management of Obesity, Diabetes and complications

Natural History of Obesity and Diabetes →	Lack of physical activity & hypercaloric diet ↓ **Overweight/ Obesity** ↓ Hyper Insulinaemia ↓ Insulin Resistance ↓ **Intermediate Hyperglycemia →**	**Clinical Diabetes and complications**: neuropathy, eye disease, blindness, nephropathy, kidney failure, peripheral vascular disease and amputations.
Level of Prevention → **Intervention Approach ↓**	**Primary Prevention**	**Secondary and tertiary prevention**
Individual approach →	Introduce nutrition counseling and physical activity to health services. Information, education and counseling through health services. Incorporate obesity and diabetes prevention into routine preventive health care services. Identification of individuals at-risk for development of obesity or diabetes and enrollment in weight reduction programs.	Introduce nutrition counseling and physical activity to health services. Self management to monitor and control blood sugar. Regular measure and control of blood pressure Yearly lipid profile and lipid control. Dietary and physical activity education to maintaining healthy and blood lipid levels. Self management for foot care. Annual eye exam, and screening for nephropathy. Increase access to essential medicines. Implement program for compliance with prescription medication.
Population based approach →	**For food and Diet** *Supply-side interventions:* Promote agricultural policies. Elimination of trans-fats. Promote urban agriculture. Improve school feeding programs. Incorporate a health concept in the international food trade. Create incentives for the development of new healthier products. *Demand-side interventions:* Promote accurate and objective information and education. Develop or update the national food and dietary guidelines. Improve product labeling. Improve relative price of foods. Develop guidelines/regulations for food marketing and advertising to children. **For physical activity** *Environmental interventions: Institutional approaches.* Promoting physical activity efforts in the workplace. Physical education programs in schools. *Environmental interventions: Urban approaches.* Transportation and Urban Planning. Recreation and Sports.	Promote daily physical activity and weight control through mass communication and information and mass media campaigns. Policies and physical environments supportive of healthy eating and physical activity. Partnership with food industry. Partnership with recreation and sports associations. Policies and financing/insurance measures to increase access to appropriate package of integrated services in PHC and hospital settings. Monitoring systems for coverage and quality of care based on agreed regional standards. Surveillance of diabetes, obesity and other risk factors.