Planning for the Future: Colorado Diabetes Prevention and Control Strategic Plan

2007-2010

Colorado Diabetes Advisory Council

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Colorado Department
of Public Health
and Environment

For further information, please contact
Diabetes Prevention and Control Program
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South, PSD A5
Denver, CO 80246-1530
Phone (303) 692-2580 or Toll Free 1 (800) 886-7689, ext. 2580
Fax (303) 691-7900
E-mail cdphe.psdrequests@state.co.us

Visit the web site at http://www.cdphe.state.co.us/pp/diabetes/index.html

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STATE OF COLORADO

Bill Ritter, Jr., Governor
James B. Martin, Executive Director

Dedicated to protecting and improving the health and environment of the people of Colorado

4300 Cherry Creek Dr. S.
Denver, Colorado 80246-1530
Phone (303) 692-2000
TDD Line (303) 691-7700
Located in Glendale, Colorado

http://www.cdphe.state.co.us

Laboratory Services Division
8100 Lowry Blvd.
Denver, Colorado 80230-6928
(303) 692-3090

Colorado Department
of Public Health
and Environment

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A Letter to Colorado,

Diabetes Mellitus is a significant public health problem in Colorado. Behavioral Risk Factor Surveillance System (BRFSS) estimates indicate that in 2006 approximately 5.3 percent or nearly 250,000 adults in Colorado have been diagnosed with diabetes. Although the prevalence of diabetes in Colorado is still lower than the national average, rates of diagnosis are increasing at a similar rate as the national average. Between 1990 and 2007, the incidence of diagnosed diabetes in the United States rose by 71%, with obesity thought to be a major contributor to this increase. Diabetes contributes significantly to cardiovascular disease, kidney disease, blindness, complications of pregnancy and lower extremity amputations. The good news is that if Coloradans take action now, diabetes and its complications can be prevented or delayed.

The *Colorado Diabetes Prevention and Control Strategic Plan* is a coordinated, statewide approach to maximize Colorado's resources, both human and financial, to reduce the incidence of diabetes in Colorado. The plan addresses the prevention of diabetes, reduction of complications commonly associated with diabetes, and enhancing organizational capabilities. The elimination of diabetes-related health disparities is woven throughout all prevention efforts.

The *Colorado Diabetes Prevention and Control Strategic Plan* is the result of the partnership between the Diabetes Advisory Council and the Colorado Diabetes Prevention and Control Program. On behalf of the council and program you are invited to join these efforts to reduce and delay the onset of diabetes and its complications and enhance the quality of life of people affected by diabetes.

Sincerely,

Michelle Hansen

Michelle Hansen MS, RD, CDE
Diabetes Program Manager

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Why Do We Need a Diabetes Strategic Plan?

Diabetes mellitus has become a major public health problem in the United States, with an estimated 23.6 million Americans affected by diabetes (7.8 percent of the population in 2007, all ages).[1] However, nearly 5.7 million of those individuals do not know that they have diabetes.[1] In 2007 alone, nearly 1.6 million Americans were diagnosed with diabetes.[1] In Colorado in 2006, nearly 250,000 Coloradans or 5.3 percent of the adult population had been diagnosed with diabetes.[2] Although the prevalence of diabetes typically increases with age, an increasing number of children and adolescents are being diagnosed with type 2 diabetes.[1] Hispanics and non-Hispanic blacks are twice as likely to develop diabetes as whites. Other ethnic sub groups, including Asians and Native Americans, also are at high risk for diabetes.[1] Obesity is an important risk factor in the development of type 2 diabetes. In the United States, the incidence of diagnosed diabetes rose 41 percent between 1997 and 2003, and obesity is believed to be a major contributor to this increase.[3]

The good news is that, if Coloradans take action, diabetes can be prevented or delayed. Lifestyle changes such as losing weight, eating fewer calories and more fruits, vegetables, and whole grains and increasing physical activity, walking 30 minutes or more most days, can significantly reduce the risk of developing diabetes. It is important for Coloradans to take advantage of the latest scientific advances and research and to expand statewide diabetes efforts to focus on the prevention of diabetes, in addition to continuing the current efforts to reduce its complications. An organized, coordinated, statewide approach to diabetes prevention and control is needed to maximize Colorado's resources, both human and financial, to reduce the costly impact of diabetes on its citizens.

As part of its national strategy, the Centers for Disease Control and Prevention (CDC) funds the Colorado Diabetes Prevention and Control Program (DPCP) to coordinate and expand state diabetes prevention and control efforts. The program resides within the Chronic Disease Prevention Branch in the Prevention Services Division of the Colorado Department of Public Health and Environment (CDPHE).

The Diabetes Advisory Council was established by the Colorado State Board of Health in 1994 to enhance the program's ability to address diabetes issues in Colorado. The mission of the council is "*to support and promote a comprehensive system of evidence-based community and health-care services to reduce or delay the onset of diabetes and its complications, and to enhance the quality of life of persons affected by diabetes.*" Comprising leaders in the diabetes care community and program staff, the council is charged with developing a state-specific strategic plan for the prevention and control of diabetes in Colorado. Using the strategic plan to give direction, the council will develop an annual work plan to guide efforts to reach the state's strategic goals.

The *Colorado Diabetes Prevention and Control Strategic Plan* provides direction for a coordinated and collaborative statewide approach to diabetes prevention and control. The aim is to engage diabetes stakeholders to pool resources, share expertise and improve health outcomes. It is imperative that we work collaboratively to avoid duplication of efforts and direct resources to where they are most needed. Only by moving forward in a coordinated effort can we achieve our ultimate goal of reducing the impact of diabetes in Colorado.

The purpose of this state plan is to provide a framework to mobilize partners around common goals affecting all areas of diabetes prevention and control in Colorado. Ideally, this plan will serve as a foundation to unify the efforts of all organizations that are involved in diabetes throughout the state in meeting the needs of the people they serve.

Diabetes Strategic Plan for Colorado

The Colorado Department of Public Health and Environment's Diabetes Prevention and Control Program was established in 1977 through funding from the Centers for Disease Control and Prevention (CDC). The program is dedicated to improving the health of people at risk for, or with, diabetes by

- working with health systems;
- supporting the implementation and sustainability of evidence-based community interventions and health communications;
- addressing diabetes-related health disparities in high-risk populations;
- conducting diabetes surveillance and evaluation;
- coordinating statewide efforts.

The program and the council have been instrumental in achieving many statewide improvements; however, work to prevent and control diabetes in Colorado must continue and grow to meet current and future needs. The continuing collaboration is essential to sustain and expand diabetes efforts statewide. The *Colorado Diabetes Prevention and Control Strategic Plan* addresses the growing challenges in the primary prevention of diabetes, including the need for professional education about diabetes primary prevention and its complications, risk factor reduction, risk assessment, screening and early detection, promotion of healthy behaviors, proactive disease management, access to quality health care, and the elimination of diabetes-related health disparities.

The program and the council are committed to improving Colorado's Diabetes Public Health System based upon CDC's national objectives for diabetes:

- Increase the percentage of people with diabetes who receive the recommended:
  - foot exams;
  - retinal exams;
  - influenza vaccination;
  - pneumococcal vaccination;
  - A1c tests.
- Reduce diabetes-related health disparities for high-risk populations.
- Link to programs that promote wellness and physical activity, weight and blood pressure control, and smoking cessation for people with diabetes.

The *Colorado Diabetes Prevention and Control Strategic Plan* is a blueprint for the Diabetes Advisory Council, and other diabetes stakeholders in Colorado, to work together to reduce the negative impact of diabetes and improve the quality of life of all Coloradans affected by diabetes. The plan is divided into four sections:

- Diabetes Prevention and Early Detection
- Diabetes Management
- Epidemiology and Surveillance
- Identifying Opportunities for Change

The goals, strategies and action steps presented will guide the efforts of the individuals, organizations and coalitions in the state dedicated to diabetes prevention and control. For the purposes of the *Colorado Diabetes Prevention and Control Strategic Plan*

- ***goals*** are high level, global plans that articulate where we want to end up through the work of the combined efforts of all involved in the work of the plan;
- ***strategies*** address the question of "how" and provide definition for work that must be done and how we expect to conduct the work in order to arrive at the goals;
- ***action steps*** are tasks that can be taken to propel the work of the strategies into action.

Diabetes Prevention and Early Detection

GOAL: Prevent, detect and delay diabetes in Coloradans through effective health systems and community interventions.

Strategy 1: Identify people at risk of developing type 2 diabetes.

Action steps

- Based upon known risk factors for type 2 diabetes, identify priority populations who are at high risk for developing type 2 diabetes.
- Promote early identification of people with diabetes.
- Conduct risk assessments for type 2 diabetes and ensure appropriate diagnostic testing is ordered.
- Reduce incidence of gestational and type 2 diabetes by promoting healthy weight and active lifestyles in women of childbearing age.
- Educate health-care providers about the high conversion rate of women with gestational diabetes mellitus to type 2 diabetes, and refer to the Colorado Clinical Guidelines Collaborative Gestational Diabetes Mellitus clinical guidelines for actions to reduce risk.
- Convey message to women on the importance of achieving prepregnancy weight within 6 to 12 months after delivery.

Strategy 2: Communicate diabetes risk factors and prevention using model public health programs directed to all population segments, with priority given to disparately affected groups.

Action steps

- Use assessment tools to raise the public's awareness of the risk of developing type 2 diabetes.
- Partner with communication specialists, stakeholders and other state and national organizations in conducting diabetes prevention campaigns utilizing already developed materials.
- Promote programs such as the National Diabetes Education Program's *Small Steps, Big Rewards: Prevent Type 2 Diabetes Healthcare Provider Toolkit* by distributing materials to diabetes partners and stakeholders.
- Empower the general public, including children, youth and adults, through education on how to reduce their risk for developing type 2 diabetes.
- Work with community organizations including faith-based organizations, schools, senior centers, community health centers, professional organizations and fraternal societies to raise risk awareness, especially in diverse, at-risk populations such as older adults, African-Americans, Hispanic/Latino, Native Americans and the uninsured.

Diabetes Prevention and Early Detection

Strategy 3: Implement effective interventions that support healthy lifestyles and early detection of diabetes.

Action steps

- Identify and encourage the implementation of evidence-based programs to increase physical activity, improve nutrition and promote weight loss.
- Partner with the Colorado Physical Activity and Nutrition Program and Coordinated School Health in promoting healthy communities and schools, increasing public awareness of healthy weight, good nutrition and physical activity.
- Partner with the Colorado Physical Activity and Nutrition Program to encourage Colorado employers to implement diabetes-prevention programs such as CDC's *Diabetes at Work.*
- Train health-care providers to follow the Colorado Clinical Guidelines Collaborative clinical guidelines for obesity.
- Ensure diabetes prevention programs are available and accessible to high-risk populations in all areas of Colorado.
- Partner with all payers to reimburse for diabetes prevention and detection services.
- Build capacity of communities throughout Colorado to offer evidence-based diabetes primary prevention programs for persons with prediabetes.

Diabetes Management

GOAL: Reduce the impact of diabetes on Coloradans by decreasing diabetes-related complications and deaths.

Strategy 1: Promote quality and consistent management of diabetes.

Action steps

- Promote the use of the Colorado Clinical Guidelines Collaborative evidence-based diabetes guidelines to health-care professionals throughout Colorado.
- Form a Medical Expert Advisory Group to communicate issues of concern that impact the diabetes community, such as diabetes drug recalls, new technologies, changes in lab values, etc.
- Partner with professional associations and health benefit plans to promote the use of the Colorado Clinical Guidelines Collaborative diabetes and gestational diabetes guidelines and to ensure providers have the appropriate tools and resources to implement the guidelines.
- Improve professional education (such as nursing and dental schools, medical education) related to the care of people with diabetes and prediabetes by including diabetes-specific content and expanding the required clinical competencies.
- Promote awareness and distribution of the Colorado *Guiding Principles for the Management of Students with Diabetes* for the safe and appropriate care of children with diabetes in schools.
- Design strategies and incentives to help more bilingual/bicultural health-care professionals pursue Certified Diabetes Educator credentials and other provider recognitions (e.g., National Committee for Quality Assurance Provider Recognition), especially in underserved areas serving diverse populations.
- Partner with academic institutions (colleges of medicine, nursing, podiatry, optometry, dentistry, nutrition, social work and public health), medical professional associations, and peer review groups to promote improved care and services for people with diabetes.
- Partner with health system projects (e.g. Improving Performance in Practice) that promote data collection and analysis, practice redesign and quality improvement in caring for people with diabetes (and other chronic diseases).

Strategy 2: Promote a team-based approach to diabetes management.

Action steps

- Promote the use of the Improving Chronic Illness Care's Chronic Care Model (see Appendix C) as a quality improvement tool for health-care practices.
- Support and promote evidence-based self-management education programs
- Promote and train the use of community health workers and promotoras to reinforce and support diabetes education.
- Facilitate the creation of diabetes care teams that include diabetes educators, navigators, promotoras and community health workers.
- Include academic institutions and research institutions such as the Rocky Mountain Prevention Research Center in the development and evaluation of community programs

Diabetes Management

Strategy 3: Identify and address gaps in diabetes care.

Action steps

- Identify diabetes care needs and work with the diabetes network to develop statewide efforts to address those needs.
- Raise awareness of the strong link between diabetes and stress and depression for both men and women with diabetes.
- Support the use of Electronic Health Records or diabetes registries by the provider community.
- Support community health centers in their efforts to improve diabetes care through participation in the Bureau of Primary Health Care's Health Disparities Collaborative.
- Collaborate with managed care plans, Medicaid, and Medicare to measure and improve diabetes care for their constituents.
- Provide training and educational opportunities for healthcare professionals that promote diabetes standards of care.

Strategy 4: Improve health outcomes for those with diabetes.

Action steps

- Promote the measurement of quality indicators for diabetes care.
- Support providing feedback to health-care providers on performance.
- Promote diabetes self-management skills including self-monitoring of blood glucose; regular dilated eye, foot and oral health exams; stress management plans; and the use of a diabetes self-management contract.

Strategy 5: Improve access to diabetes services and education for those who are underserved.

Action steps

- Ensure diabetes educational messages are culturally relevant and appropriate for different literacy levels.
- Support the provision of diabetes services in community settings rather than in just clinical settings.
- Foster sensitivity to the differing needs and appropriate interventions for specific populations including men, women, children, diverse populations and rural communities.

Epidemiology and Surveillance

GOAL: Develop and integrate a surveillance and evaluation system that informs and supports: local level decision-making; state resource allocation; practice-based research; and local, state and national policy development.

Strategy 1: Improve diabetes-related surveillance efforts

Action Steps

- Based on existing diabetes surveillance resources as outlined by CDC and prior work of the Colorado DPCP, determine indicators of diabetes prevention and control that are sufficiently valid and sensitive to change. Present these indicators annually in a brief statewide report available through the DPCP website and linked to the CDPHE health statistics portal.

- Collaborate with SEARCH for Diabetes in Youth, a research project of UCD, Preventive Medicine and Biometrics to make county and state level incidence data on diabetes in children available through the DPCP website and linked to the CDPHE health statistics portal.

- Partner with other CDPHE programs and state agencies to develop a long term plan for coordinated and integrated local level surveillance that can be used a) for local planning and evaluation, as well as b) state level planning and resource allocation. Assure that key measures, related to diabetes prevention and control, are valid and useful for planning and evaluation.

- Develop a mechanism to populate CDC's map of local programs in order to promote access to programs and services. Develop reports that describe local and state program capacity in order to inform diabetes prevention and control priorities.

Strategy 2. Enhance evaluation of diabetes-related initiatives

Action Steps

- Work with partners at the CDPHE, PHAC, RMPRC and CSPHI to provide training and technical assistance on program planning and evaluation for state and local partners, as needed.

- Partner with the Interagency Prevention Leadership Council, RMPRC and CSPHI to promote the development of practice-based evidence through stronger evaluations of diabetes prevention programs. Link with the service to science program to build capacity and support dissemination of effective community programs.
  http://www.colorado.gov/cs/Satellite/Best-Practices-V2/BPV/1216289070758

Epidemiology and Surveillance

Strategy 3. Support translation of diabetes research into practice

Action Steps

- Work with Colorado's academic and research centers to disseminate the results of their diabetes research to health care professionals and other community stake holders.

- Partner with UCD SOM Department of Family Medicine to support and promote Primary Care Practice Based Research and continuous quality improvement in diabetes prevention and control.

- As part of the long term surveillance plan (referenced in strategy 1 above), work with the RMPRC along with academic and practice partners to establish surveillance measures that are population-based, and that are used to for practice-based public health research and continuous quality improvement studies in public health.

Abbreviations:

CDC—Centers for Disease Control
CDPHE—Colorado Department of Public Health and Environment
CSPHI – Colorado School of Public Health Initiative
DPCP—Diabetes Prevention and Control Program
PHAC – Public Health Alliance of Colorado
RMPRC – Rocky Mountain Prevention Research Center
UCD SOM— University of California Davis School of Medicine

Identifying Opportunities for Change

GOAL: Identify opportunities for change through network activities that support diabetes prevention and control.

Strategy 1: Build and mobilize a statewide diabetes network to coordinate and conduct activities that support diabetes prevention and control.

Action Steps:

- Identify local and state diabetes partners to build a diabetes network.
- Conduct training for members on effective networking utilizing the Health Policy Guide from the Center for Health Improvement.
- Through the statewide diabetes network raise public awareness about issues related to diabetes prevention and control.
- Develop fact sheets highlighting the human and economic costs of diabetes in Colorado, including the costs and benefits of good diabetes management.
- Coordinate with other diabetes-related public policy initiatives.
- Engage health professionals and organizations to publicly support diabetes care issues.

Strategy 2: Educate policy makers, community leaders, and funding sources about the importance of public policies and programs that support diabetes prevention and control.

Action Steps:

- Use the Colorado Diabetes Strategic Plan as a communication tool.
- Ensure health care providers have access to the tools they need to treat diabetes to best evidence standards or guidelines.
- Identify diabetes experts to conduct policy analysis and assessment.
- Tailor "talking points" to the specific audience.
- Develop an agenda annually with identified opportunities for change.

Strategy 3: Develop and sustain diabetes community coalitions throughout Colorado.

Action Steps

- Work with community organizations and programs to improve health promotion activities as part of their efforts to achieve Healthy People 2010 objectives.
- Partner with community-based diabetes programs, diabetes centers, community groups, faith-based organizations, senior centers, schools and providers, especially those serving diverse, at-risk populations.
- Engage underserved populations to become diabetes system partners.

Evaluation Plan

The intent of evaluation is to support the state plan as it evolves and to allow for the flexibility to respond to emerging issues and contextual circumstances. All activities outlined in this plan will be evaluated to identify areas that require modification and to assess program impact.

Process Evaluation

This component of evaluation focuses on the ongoing tracking of progress made toward completing activities designed to bring about changes directly linked to the program's goals.

The process evaluation will determine

- the extent to which the plan is being implemented as intended;
- the degree to which goals and strategies are progressing towards completion over the course of the four-year plan, including assessing the strengths, weaknesses and lessons learned during the implementation of the plan;
- how the program appropriately focuses diabetes health efforts, especially toward priority populations.

Outcome Evaluation

The outcome evaluation determines whether or not changes are occurring and the impact of the changes in the state. Outcomes include changes in diabetes risk factors such as hypertension, physical inactivity and excess body weight.

The outcome evaluation will

- determine changes in behavior, services and policies that have occurred as a result of the plan;
- assess the inroads in addressing health disparities;
- determine if educational intervention increases public awareness of diabetes;
- track the changes occurring in the state population's diabetes burden and risk factors over time (as measured primarily through vital statistics, hospital discharge data and the Behavioral Risk Factor Surveillance System).

Surveillance

Using existing data systems, such as the Behavioral Risk Factor Surveillance Survey, Child Health Survey, Pregnancy Risk Assessment Monitoring System, HEDIS® data, vital statistics and hospital discharge data, the Diabetes Prevention and Control Program has the capacity to track changes. The program will continue to use the existing data systems to continue its surveillance of diabetes and related risk factors.

Healthy People 2010 Objectives

5-1 **Increase the proportion of persons with diabetes who receive formal diabetes education.**

5-2 **Prevent diabetes.**

5-3 **Reduce the overall rate of diabetes that is clinically diagnosed.**

5-4 **Increase the proportion of adults with diabetes whose condition has been diagnosed.**

5-5 **Reduce the diabetes death rate.**

5-6 **Reduce diabetes-related deaths among persons with diabetes.**

5-7 **Reduce deaths from cardiovascular disease in persons with diabetes.**

5-10 **Reduce the rate of lower extremity amputations in persons with diabetes.**

5-11 **Increase the proportion of persons with diabetes who obtain an annual urinary microalbumin measurement.**

5-12 **Increase the proportion of adults with diabetes who have a glycosylated hemoglobin measurement at least 2 times a year.**

5-13 **Increase the proportion of adults with diabetes who have an annual dilated eye examination.**

5-14 **Increase the proportion of adults with diabetes who have at least an annual foot examination.**

5-15 **Increase the proportion of persons with diabetes who have at least an annual dental examination.**

5-16 **Increase the proportion of adults with diabetes performed self-blood glucose monitoring at least once daily.**

What is Diabetes?

When a person has diabetes, the body either does not produce enough insulin or cannot effectively use the insulin it produces or both. This causes glucose levels to increase in the blood. Diabetes can cause serious health complications including heart disease, kidney failure, blindness and diabetic nerve disease that can lead to amputation of the lower extremities. There are three major classifications of diabetes: type 1, type 2 and gestational diabetes mellitus (GDM). Prediabetes recently has been recognized as a separate diagnosis.

Type 1 diabetes

Type 1 diabetes, formerly called insulin-dependent or juvenile onset diabetes, occurs when the body's immune system destroys the beta cells in the pancreas that are responsible for producing the hormone insulin.[1] Type 1 diabetes is an autoimmune disease and, at this time, is not preventable. Type 1 diabetes is typically diagnosed in people younger than 30 years of age and accounts for fewer than 10 percent of all diagnosed cases of diabetes.[1] A person with type 1 diabetes requires insulin injections to stay alive.

The Diabetes Control and Complication Trial demonstrated that intensive insulin therapy significantly reduced the risk of developing microvascular complications (retinopathy, nephropathy and neuropathy) when compared to conventional insulin therapy.[4] In a 17-year follow-up, people who were enrolled in the intensive arm of the trial had a 42 percent reduction in macrovascular (heart attack and stroke) complications when compared to people receiving conventional treatment.[4]

Type 2 diabetes

Type 2 diabetes, previously called non insulin dependent diabetes mellitus or adult-onset diabetes, accounts for about 90 to 95 percent of all diagnosed cases of diabetes.[5] Until recently, type 2 diabetes typically occurred in people older than 30 years of age. With increases in overweight children, youth and adolescents, the rate of type 2 diabetes in children and adolescents has increased to 0.2 percent.[1] Estimates of undiagnosed diabetes are unavailable for this age group. In 2007 approximately 186,300 people in the United States below the age of 20 years have diabetes (type 1 or type 2).[6] Type 2 diabetes is caused when the body develops resistance to the insulin the body produces. With time, the ability of the pancreas to release enough insulin to maintain a normal blood sugar declines. Risk factors for type 2 diabetes include obesity, lack of physical activity, family history of diabetes, older age and race/ethnicity. People of African-American, Hispanic/Latino, and Native American ancestry and some Asian American and Pacific Islander groups are at particularly high risk of developing type 2 diabetes.[5]

In the United Kingdom Prospective Diabetes Study, people with type 2 diabetes who had intensive blood glucose control had a 25 percent decrease in the risk of developing microvascular complications compared to people with only diet control.[7] The study demonstrated that, irrespective of therapy, for every 1 percentage point reduction in glycosylated hemoglobin (A1c) there was a 14 percent reduction in the risk of heart attack and death, a 12 percent reduction in the risk of stroke, a 16 percent reduction in the risk of congestive heart failure, a 42 percent reduction in the risk of amputation or death from peripheral vascular disease and a 37 percent reduction of composite microvascular complications.[7]

People with type 2 diabetes can be treated with oral medications or injectable insulin, diet and regular exercise. Controlling blood pressure and lipids to the current guidelines also is critical in reducing macro- and micro-vascular diabetes complications. Since type 2 diabetes is occurring in younger age groups, the complications of type 2 diabetes will occur earlier in life, affecting people during their working and reproductive years.

Gestational Diabetes

Gestational diabetes mellitus (GDM) is diabetes that is diagnosed during pregnancy and develops in about 7 percent of all pregnancies, resulting in over 200,000 cases annually.[8] GDM is usually diagnosed during weeks 24-28 of pregnancy. It is important to screen pregnant women for abnormal glucose tolerance because if untreated, GDM can cause macrosomia (large baby) and low blood glucose levels in the newborn.[9] Children born to GDM mothers have increased risk of being overweight or obese.[9,10]

GDM is glucose intolerance identified for the first time during pregnancy. As a pregnancy progresses, the body may become insulin resistant due to the increased production of certain placental hormones.[9] Risk factors for GDM include being obese, genetics, 35 years of age or older and having Polycystic Ovary Syndrome.[11] GDM usually resolves after delivery but is likely to appear in subsequent pregnancies.[12] Immediately after pregnancy, 5 to 10 percent of GDM mothers are found to have diabetes, usually type 2. Women who have had GDM have a 40 to 60 percent risk of developing type 2 diabetes in the first 5-10 years postpartum.[1]

Diabetes Prevention

Given the significant complications associated with diabetes, the best management strategy is prevention. Delaying the onset of disease or slowing its progression results in health benefits for persons with diabetes. The Diabetes Prevention Program Research Group has provided convincing evidence that lifestyle modification or treatment with metformin can prevent or delay the progression to type 2 diabetes among high-risk adults with prediabetes.[13] At an average follow-up of 2.8 years, lifestyle intervention (with the goals of at least a 7 percent weight loss and at least 150 minutes of physical activity per week) reduced the incidence of type 2 diabetes by 58 percent in all racial and ethnic groups compared with the placebo.[13] In this study, metformin therapy (with no attempt at lifestyle modification) reduced the incidence of type 2 diabetes by 31 percent.[13]

Prediabetes

Prediabetes is a condition in which a person's blood sugar is elevated but is not quite high enough to be diagnosed as diabetes. Fasting plasma glucose results of 100-125 mg/dl or oral glucose tolerance results of 140-199 mg/dl indicates "pre- diabetes." Recent research estimates that 26 percent of adults aged 20 years and older (approximately 57 million individuals) in the United States have prediabetes.[1]

Prediabetes is not a benign condition since there is increased risk of developing type 2 diabetes. However, with weight loss, eating fewer calories and more fruits and vegetables, and increasing physical activity, persons with prediabetes can prevent or delay the onset of type 2 diabetes.[13] People with prediabetes are at increased risk of developing cardiovascular disease,[14] but significant complications associated with diabetes can be avoided if steps are taken to ensure that prediabetes does not progress to diabetes.

Risk Factors for Type 2 Diabetes

There are several factors that increase a person's risk of developing type 2 diabetes: [15]

- overweight (Body Mass Index $\geq$25.0 kg/m^2)
- physical inactivity
- a first degree relative with diabetes, such as parent or grandparent, sister or brother
- other clinical conditions associated with insulin resistance (e.g., acanthosis nigricans; a waist circumference >40 inches in men and >35 inches in women; or polycystic ovary syndrome
- a HDL cholesterol level <35 mg/dl and/or a triglyceride level >250 mg/dl
- documented history of prediabetes, impaired fasting glucose or impaired glucose tolerance
- for women, a previous history of gestational diabetes or delivery of a baby weighing more than 9 pounds at birth
- member of a high-risk ethnic population, such as Hispanic/Latino, African-American, Native American, Asian American, Pacific Islander.

Diagnostic Criteria for Diabetes

- The routine test for diabetes is a fasting blood glucose test (no food for at least 8 hours prior to the blood test). A confirmed fasting blood glucose value greater than or equal to 126 milligrams/deciliter (mg/dl) on two separate occasions indicates a diagnosis of diabetes.[15]
- In the presence of the symptoms of diabetes (excessive urination, excessive thirst and unexplained weight loss), a random (non fasting) blood glucose value of greater than or equal to 200 mg/dl on separate occasions indicates a diagnosis for diabetes.[15]

- An Oral Glucose Tolerance Test is another test used to diagnose diabetes. A two-hour plasma glucose value of greater than or equal to 200 mg/dl indicates a diagnosis of diabetes.[15]

Improving Diabetes Care

The key to improving diabetes care is the development of a partnership between the person with diabetes, the health-care system, and the community. To help ensure Colorado health-care providers are using evidence-based guidelines to manage their patients with diabetes, the Diabetes Prevention and Control Program and Diabetes Advisory Council members partnered with Colorado Clinical Guidelines Collaborative to develop statewide, comprehensive, but easy-to-use guidelines for adult diabetes and gestational diabetes. (See Appendix B). These guidelines were developed through a collaborative effort involving many organizations and incorporate evidence-based information in simple one-page formats. These and other clinical guidelines pertinent to diabetes care such as cardiovascular risk assessment, tobacco cessation, obesity and depression are located on the collaborative website.[16]

Persons with diabetes who are knowledgeable and skilled at managing their disease are more likely to minimize the potential costly and debilitating complications. Self-management refers to the day-to-day activities undertaken by individuals to control and monitor their diabetes. Achieving guideline targets for blood sugar, blood pressure and blood cholesterol, in conjunction with weight control, smoking cessation and regular medical examinations, can help those with diabetes live full and productive lives. Other important tests or services include regular eye exams, oral health and foot exams, as well as flu and pneumonia vaccinations.

It is critical that people with diabetes work together with their health-care team to develop a self-management plan that includes goals for diet, exercise, medication and routine testing.

The Impact of Diabetes in Colorado

Scope

Both the prevalence and scope of diabetes mellitus make it a significant public health problem in Colorado. Approximately 5.3 percent of adults, or nearly 250,000 people, in Colorado have been diagnosed with diabetes.[2] Given that diabetes often remains undiagnosed, it is likely that many more individuals actually have diabetes and do not know it. Because diabetes is a chronic disease and there is no cure, people with diabetes have a lifelong need for good self-management skills and quality medical care. Uncontrolled diabetes results in a host of complications that decrease quality of life and shorten lifespan.

Over the past 15 years, the rate of adults diagnosed with type 2 diabetes in Colorado has increased. This increase is in part related to a rise in obesity, the aging of the population and an increase in the Hispanic population.

The prevalence of gestational diabetes mellitus (GDM) in Colorado varies in direct proportion with the prevalence of type 2 diabetes in a given ethnic group.[17] The prevalence has increased 95 percent, from 2.1 percent in 1994 to 4.1 percent in 2002, with significant increases in all racial/ethnic groups.[17] Although the mechanism behind this increase is unknown, it is suspected to be related to both an increase in pre-pregnancy body mass index as well as an increase in age at pregnancy. According to the 2006 Pregnancy Risk Assessment Monitoring System, 8.9 percent of all pregnant women in Colorado developed GDM and 1.5 percent of all pregnant women in Colorado had pre-existing diabetes. [(18)]

Estimates of diabetes prevalence among youth are available through the SEARCH for Diabetes in Youth Study. Approximately 150,000 children and youth under 20 years old have been diagnosed

with diabetes nationwide.[19] Prevalence is lower for children under 10 years than for those between the ages of 10 and 19.[18] Non-Hispanic white children had the highest prevalence in the younger group, while prevalence was highest among black and non-Hispanic white youth in the older age group.[18] For children under age 10, type 1 diabetes accounted for approximately 80 percent of diabetes cases.[19] Type 2 diabetes was more likely to be found in the older age group and varied significantly by race and ethnicity. While 6 percent of diabetes among 10 to 19-year-old non-Hispanic white youth with diabetes was type 2, the percentage of type 2 diabetes among American Indian youth was 76 percent in this age group with diabetes.[19]

In a 2007 article in *Diabetes Care*, a group of Colorado researchers reported that the incidence of type 1 diabetes in youth from birth to 17 years old increased from 14.8/100,000 population to 23.9/100,000 population between 1978 and 2004 for non-Hispanic white and Hispanic children and youth.[20] This represents an average increase of 2.3 percent per year, for an overall increase of 160 percent.[20]

Although type 1 diabetes is the more common form of diabetes in youth, the incidence of type 2 diabetes in youth also is increasing along with the increase in childhood obesity. Males born in the year 2000 have a 32.8 percent estimated lifetime risk of developing diabetes while females have a 38.5 percent lifetime risk.[21] The highest prevalence of type 2 diabetes is observed among American Indian youth.[21]

Morbidity and Mortality

High blood glucose levels can cause nerve damage, diabetic retinopathy, lower extremity amputations, kidney failure, heart disease, stroke, gastroparesis, oral health problems, poor wound healing and skin disorders.[5] Nerve damage from diabetes also causes sexual dysfunction and urologic disorders, including bladder problems and urinary tract infections.[22] People with diabetes are more susceptible to illness than the general population, and once ill, experience greater severity of illness than people without diabetes. Uncontrolled diabetes can lead to an extended hospital stay and an increase in the use of intensive care unit resulting in higher medical costs, nearly doubling the cost of care when hospitalized. In 2007, the age-adjusted hospitalization rate for people with diabetes in Colorado was 132/10,000. This represented 58,434 hospitalizations, or 12.0 percent of all Colorado hospitalizations for that year. Eight percent of hospitalizations in 2007 listed diabetes as the primary diagnosis or 4,744 hospitalizations.

Diabetes can result in devastating complications. Nationwide, diabetes is the leading cause of blindness among adults 20-74 years of age, resulting in 12,000-24,000 new cases of blindness each year.[1] More than 60 percent of people with diabetes have some form of nervous system damage resulting in 71,000, non-traumatic lower limb amputations.[1]

Diabetes also is the leading cause of kidney failure, accounting for 44 percent of new cases in 2005.[1] Treatment for end-stage kidney disease began for 46,739 individuals in the United States and Puerto Rico in 2005.[1] During that year, a total of 178,689 people with end-stage kidney disease due to diabetes in the United States and Puerto Rico were living on chronic dialysis or with a kidney transplant.[1] By the end of 2007, 1,608 Coloradans with diabetes were living on chronic dialysis.[23]

Diabetes is the seventh leading cause of death in the United States and seventh leading cause of death in Colorado.[1] Overall, individuals with diabetes have twice the risk for death compared with individuals without diabetes of similar age.[1] Adults with diabetes have a two to four times higher risk of stroke than people without the disease and are also at high risk for heart disease.[1] It is estimated that 60-70 percent of people with diabetes have mild to severe forms of nervous system damage such as impaired sensate, slowed digestion, carpal tunnel syndrome, erectile dysfunction, or other nerve problem.[1] It has been estimated that an individual diagnosed with diabetes at age 40, will lose between 11.6 and 14.3 years of life.[21]

Good control of blood sugar, blood lipids and blood pressure, as well as weight control, smoking cessation and regular medical examinations, allow a person with diabetes to live a full and productive life and avoid costly and debilitating complications.

There are multiple factors that contribute to the incidence of diabetes and less than optimal management. Social and environmental factors in the United States contribute to the increasing rate of obesity, a major risk factor for type 2 diabetes. Sedentary behavior, along with large portion sizes and over-indulgence in high-calorie foods, has become commonplace. People are unable to lose weight and

keep it off. They are unable to increase physical activity because of cost, safety concerns or lack of options. Gaps in the health-care system, including a fragmented delivery system, a health-care reimbursement system that is limited or structured to pay for treatment rather than prevention, and increasing numbers of uninsured or underinsured people interfere with the prevention and aggressive treatment of diabetes..

Just as a host of environmental and social elements influence the prevention or onset of diabetes, a variety of factors influence the progression of it. Management of diabetes encompasses more than simply adequate medical care. It also requires a realignment of both personal and societal priorities including, but not limited to, nutritious (whole grains, low-fat, low-calorie) food that is easily available and affordable, a work site culture that encourages physical activity, improved communication between diabetes providers and patients, greater emphasis on involving people with diabetes in their own health-care, access to health-care, and a restructuring of the reimbursement system for better coverage of medications and prevention services.

Cost

Diabetes has enormous personal, economic and societal costs. The annual health-care expenses related to diabetes in the United States are high, with an estimated cost of $174 billion in 2007, including both direct medical expenses and loss of productivity.[24] The care of diabetes-associated chronic complications alone costs $58 billion each year. Overall, more than $1 of every $10 spent in the United States on health-care is attributable to diabetes.[24] After adjusting for age, sex and race/ethnicity, people with diabetes had health-care costs that were 2.4 times that of people without diabetes.[1]

Hospitalization accounts for 50 percent of all direct diabetes-related expenditures.[24] In 2006, the average hospital charge for a person in Colorado with diabetes was $16,297 with an average length of stay of 3 days.[22] The total cost of diabetes for people in Colorado in 2006 is estimated at $2,505,000,000.[25] This estimate includes excess medical costs of $1,605,000,000 attributed to diabetes, and lost productivity valued at $900,300,000.[25] When diabetes is controlled, complications may be reduced, such as amputations, kidney disease and hypoglycemia, all requiring hospitalization..

The national cost of indirect expenses account for approximately $58.2 billion of the annual cost of diabetes.[25] These expenses, which include lost productivity, early mortality and permanent disability, are difficult to assess.

At the national level the number of workdays absent because of diabetes in 2007 is estimated at 15 million, at a national cost of $2.6 billion.[25] In addition the presenteeism loss is equivalent to 120 million workdays lost with an estimated national cost of $20 billion.[25]

The cost of end stage kidney disease is high. In 2005, total Medicare costs for patients with Chronic Kidney Disease and End Stage Renal Disease in the United States approached $42 and $20 billion respectively.[26] The cost of ESRD represents approximately 6.4 percent of the annual Medicare budget.[26] The human cost, in terms of quality of life, use of social resources and rehabilitation, is immeasurable.

Given the scope and complexity of the problem, any effort to prevent or delay the onset of diabetes and its complications requires the coordinated efforts of all of us.

Partners in Health

Our public health system comprises a complex network of people, systems and organizations working in the public (local, state, and national levels) and private arenas. This infrastructure is responsible for protecting people's health and safety, providing credible information for better health decisions, and promoting good health through a network of partnerships. These components assist public health professionals in carrying out the 10 essential functions of public health. (see Appendix B)

The **Centers for Disease Control and Prevention** (CDC) **Division of Diabetes Translation** funds 59 state-based programs to coordinate public health efforts around diabetes prevention and control. The **Colorado Diabetes**

and Control Program, along with statewide partners and stakeholders is required to build on expertise in program, science and policy areas to control and prevent diabetes; coordinate statewide diabetes control and prevention; expand systems to define and analyze the scope of the diabetes problem; improve access to diabetes care for all people and raise the quality of that care; use statewide public health projects to reduce diabetes-related problems; and inform, educate and empower external supporters to control and prevent diabetes.
http://www.cdc.gov/diabetes/about/index.htm

National Diabetes Education Program (NDEP)

The National Diabetes Education Program is a federally funded program sponsored by the U.S. Department of Health and Human Services' National Institutes of Health and the Centers for Disease Control and Prevention and includes more than 200 partners at the federal, state and local levels, working together to reduce the morbidity and mortality associated with diabetes.
http://www.ndep.nih.gov/

Colorado Department of Public Health and Environment

The Colorado Department of Public Health and Environment serves as the hub of public health information and services for the state. Supported by state and federal funds, the state health department is accountable for connecting local communities with essential information and resources to promote better health. The state health department works closely with other partner organizations including nonprofits and health-care providers on many initiatives to improve health in Colorado. Examples of these organizations and initiatives are listed below.
http://www.cdphe.state.co.us/pp/diabetes/index.html

American Diabetes Association

The American Diabetes Association, founded in 1940, is a nonprofit organization with programs in all 50 states and the District of Columbia, reaching hundreds of communities. The mission of the association is to prevent and cure diabetes and to improve the lives of all people affected by diabetes. To fulfill this mission, the association funds research; publishes scientific findings; and provides information and other services to people with diabetes, their families, health professionals and the public.
http://www.diabetes.org/home.jsp

American Heart Association/American Stroke Association

The American Heart Association/American Stroke Association is a national voluntary agency whose mission is to build healthier lives free of cardiovascular diseases and stroke. The association is divided physically into the National Center (located in Dallas, Texas) and 12 affiliate offices that cover the United States and Puerto Rico. Millions of volunteers and donors support the efforts of the association every year.
http://www.americanheart.org/

Barbara Davis Center for Childhood Diabetes

The Barbara Davis Center for Childhood Diabetes is the largest diabetes and endocrine care program in the Colorado community. The mission of the Barbara Davis Center is to provide care for children and adults with diabetes; to provide a unique environment to foster clinical and basic biomedical research; and to support the development and application of research for the prevention, cure and understanding of the disease process that leads to diabetes.
http://www.childrensdiabetesfdn.org/

Cancer, Cardiovascular and Chronic Pulmonary Disease Prevention, Early Detection and Treatment Program

During the 2005 legislative session, the Colorado General Assembly enacted legislation (House Bill 05-1262) that allocated 16 percent of the revenue generated from the passage of a constitutional amendment to increase the excise tax on tobacco products for a competitive grants program for the prevention, early detection and treatment of cancer, cardiovascular disease (including diabetes) and pulmonary disease. The program is intended to assist in the implementation of the state plans for cancer, cardiovascular disease, diabetes and pulmonary disease. Requests for applications are solicited annually.
http://www.cdphe.state.co.us/pp/ccpd/.

Colorado Business Group on Health

Founded in 1996, the Colorado Business Group on Health is a non-profit organization representing 22 purchaser organizations and more than 200,000 covered lives in Colorado. The organization collaborates with health plans, providers and purchasers to improve the value and quality of health care. A member of the National Business

Group on Health, the Colorado group has implemented the Bridges to Excellence pay-for-performance program in Colorado Springs. The Bridges to Excellence Initiative is a multistate, multi-employer coalition developed by employers, physicians, health-care service researchers and other industry experts to identify and reward quality across the health-care system.
http://www.bridgestoexcellence.orgBridges

Colorado Clinical Guidelines Collaborative
Colorado Clinical Guidelines Collaborative is a nonprofit coalition of more than 50 Colorado health-care organizations representing providers, health plans, hospitals, employers, public health entities and others working together to reduce fragmentation and implement systems and processes, using evidence-based clinical guidelines, to improve health-care in Colorado.
http://www.coloradoguidelines.org/

Colorado Consumer Health Initiative
The Colorado Consumer Health Initiative is a statewide membership organization comprising organizational and individual health-care consumer advocates. The Health Initiative acts as a unified representative of its members and partners at the legislature and in the community to influence and shape effective health-care policy to ensure barrier-free access to quality health care for all Coloradans.
http://www.cohealthinitiative.org/

Colorado Community Health Network
Colorado Community Health Network is the membership association representing Colorado's 14 federally qualified community health centers operating 118 sites across the state. Founded in 1982 as a nonprofit organization, the network is recognized as Colorado's Primary Care Association. It provides technical assistance, training, data analysis and other resources to generate and document improved health outcomes for underserved populations; transform clinical practice through models of care, improvement and learning; develop the infrastructure, expertise and multi-disciplinary leadership to support and drive improved health status; and build strategic partnerships. All of the network's member sites participate in the Bureau of Primary Health Care's Health Disparities Collaborative, a quality improvement program to improve the quality of care and self-management skills for their patients.
http://www.cchn.org/

Colorado Foundation for Medical Care
The Colorado Foundation for Medical Care, Colorado's Medicare quality improvement organization, contracts with the Centers for Medicare and Medicaid Services to ensure that Medicare beneficiaries receive the highest quality of health care. With approximately 90 employees, the foundation provides quality improvement and utilization review services for Medicare, Medicaid and other public and private clients. It works collaboratively with government programs, health providers and managed care companies to improve the quality of health care.
http://www.cfmc.org/

Colorado State University Extension Service
Colorado State University Extension is the local community connection for university research, information, education, expertise and nutrition education programs (diabetes, eating right and spending smart). Colorado State University's 59 extension offices provide university expertise for all Colorado citizens on the job, at home and in communities. Colorado State Extension takes the knowledge from campus and focuses on putting that knowledge to work through effective partnerships within the state and with state agencies to deliver quality programs that positively impact lives.
http://www.ext.colostate.edu/

Improving Performance In Practice
Improving Performance in Practice is a grant-funded initiative developed through the American Board of Medical Specialties along with the Boards and Societies of Family Medicine, Internal Medicine and Pediatrics to improve the quality of care in the primary care setting. The initiative staff provides in-office technical assistance to primary care offices to improve quality of care, efficiency and satisfaction for patients and the health-care team. Colorado was selected as one of two states to participate in this demonstration project with Colorado Clinical Guidelines Collaborative as the lead organization. Initially, the practices are focusing on diabetes, smoking cessation and asthma to develop efficient patient-centered systems that then can be applied to other health conditions.
http://www.coloradoguidelines.org/

Rocky Mountain Association of Diabetes Educators

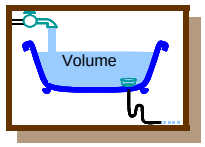
The Rocky Mountain Association of Diabetes Educators is the Colorado chapter of the American Association of Diabetes Educators. Its mission is to promote the profession of diabetes education by growing new educators and enhancing the skills of current educators, advocating for people with diabetes and professionals that treat diabetes, and improving diabetes care in the Rocky Mountain Region.
http://www.rmade.org

Rocky Mountain Prevention Research Center

The Rocky Mountain Prevention Research Center is one of 33 prevention research centers funded by the Centers for Disease Control and Prevention. The center is located both at the University of Colorado Health Sciences Center in Denver and in the community of Alamosa in the San Luis Valley. The mission of the center is to connect science and practice through a network of academic, public health and community partnerships engaged in scholarly, community-based prevention research, research translation and education.
http://www.uchsc.edu/rmprc

University of Colorado at Denver Health Sciences Center

The mission of the center is to operate a state-of-the-art teaching and research facility providing comprehensive medical care and dedicated to serving the people of Colorado and the nation; excelling in the education of health professionals; delivering comprehensive patient care; and advancing knowledge through research.
http://www.uchsc.edu/



Thinking Ahead

In Colorado, systems thinking informs decision-making about potential interventions to impact prevention and control of diabetes. It will help answer the question: what is the optimal allocation of the state's assets to achieve the elimination of death, disability, disparities and costs due to preventable diseases? What mix of diabetes prevention and management programs will yield the best results for the state? Optimally, the model will be used to show the synergies of treating risk factors that lead to multiple chronic illnesses and the downstream benefits of treating one disease that can be a risk factor for other diseases.

Systems thinking recognizes that in complex systems, events are separated by distance and time; therefore, small catalytic events can cause large changes in the system. It acknowledges that a change in one area of a system can adversely affect another area of the system; thus, it requires organizational communication at all levels to avoid the silo effect.

What does diabetes look like from 30,000 feet and from a population perspective? The model's purpose is to help us understand how diabetes changes over time. The systems thinking map illustrates population level health and not the experience of any one person; however, everyone in the population fits in one of the boxes. The model tracks the flow of patients across several stages of severity of illness. Interventions are targeted at slowing the rate of progression across the stages as well as preventing the disease in the first place.

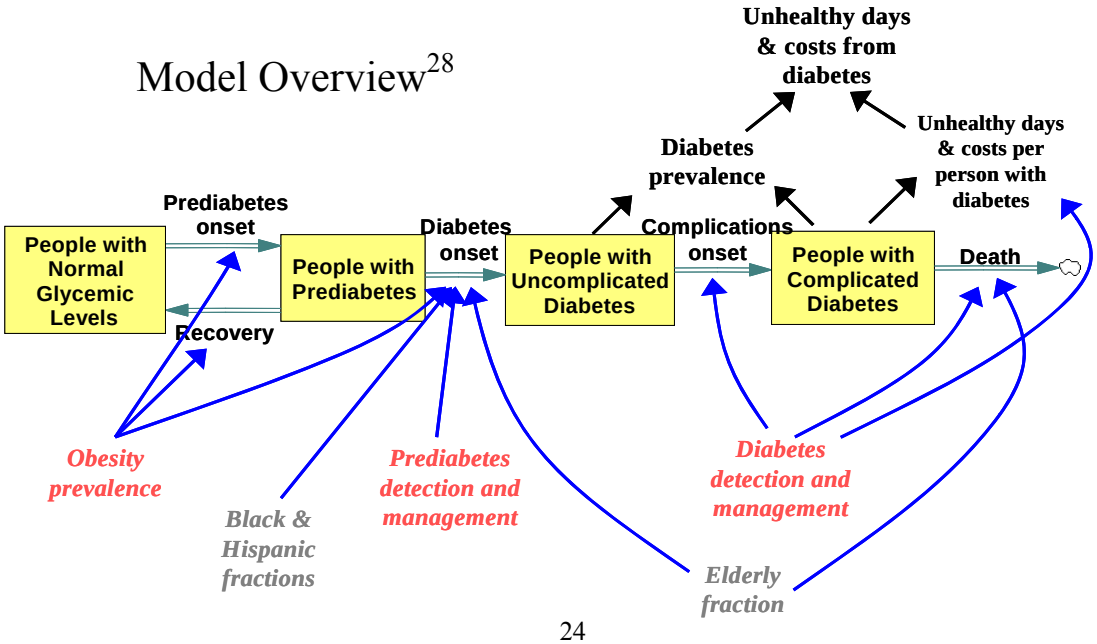
A good analogy is to think of each yellow box as a bathtub. The volume in the tub, or number of people in any one yellow box or stock, is driven by the inflow of water into the tub relative to the outflow of water from the tub:

If the inflow is greater than the outflow…
the water level will increase.
If the outflow is greater than the inflow…
the water level will decrease.
If the inflow is equal to the outflow…
the water level will stay the same.

This diagram can help us learn to see and experience the WHOLE system, and represents our theory about the most important drivers of the **burden of diabetes**. The burden includes all of the additional suffering (morbidity) and spending (cost) attributable to diabetes. *The drivers (italics) in gray are not amenable to change, but those in red we can do something about.*

Note: The model assumes we subdivide the diabetes and prediabetes population stocks into stocks of diagnosed and undiagnosed, although they are not shown here.

Model Overview[28]



Future Possibilities for Diabetes in Colorado

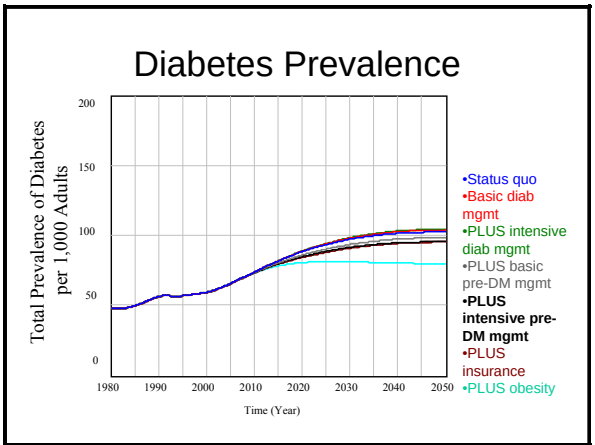
A Series of Cumulative Policy Change Scenarios[28]

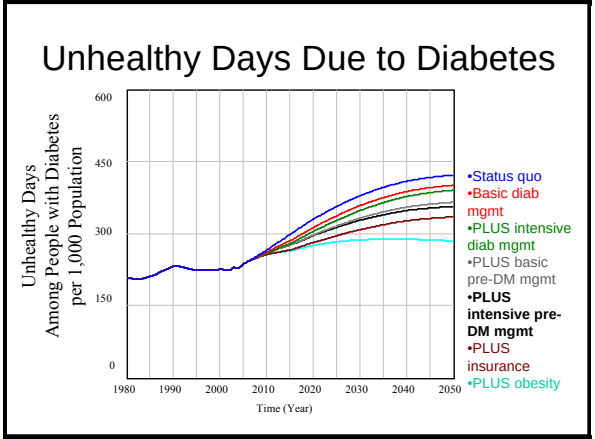
The systems dynamics model uses computer simulation to assess the impact of possible interventions and given uncertainties and provides an opportunity to estimate the impact of selected interventions. Simulation experiments with a system dynamics model has been developed by the CDC for Colorado on diabetes prevalence and unhealthy days due to diabetes, both diagnosed and undiagnosed, which is driven by diabetes education.

Specific diabetes education policy changes, implemented cumulatively:
–Step 1: Increase basic diabetes management from 2006 value to 75% by 2015 **(red)**
–Step 2: Step 1 PLUS increase intensive fraction of diabetes management from 2006 value to 75% by 2015 **(green)**
–Step 3: Step 1 and 2 PLUS increase basic prediabetes management from an estimated 10% to 50% 2006 – 2015 **(gray)**
–Step 4: Steps 1-3 PLUS increase intensive fraction of prediabetes management from an estimated 0% to 50% 2006 – 2015 **(black)**
–Step 5: Steps 1-4 PLUS increase insured fraction from 2006 value to 95% by 2015 **(maroon)**
–Step 6: Steps 1-5 PLUS reduce obese fraction to 1991 value by 2025 **(teal)**

Baseline projection **(blue line)** assumes:
-Slowing growth in obesity over time, and
-After 2005, no further change in:
Non-diabetes-related death rates
Insured fraction of the general population,
Diabetes medication taking,
Diabetes management.

Model parameters:
Best available evidence from epidemiological studies, surveillance data, clinical trials and expert estimates (where necessary)
State characteristics:
BRFSS, vital statistics and census estimates and projections. State model is calibrated using historical data for 1980 – 2005; trends are projected to 2050.





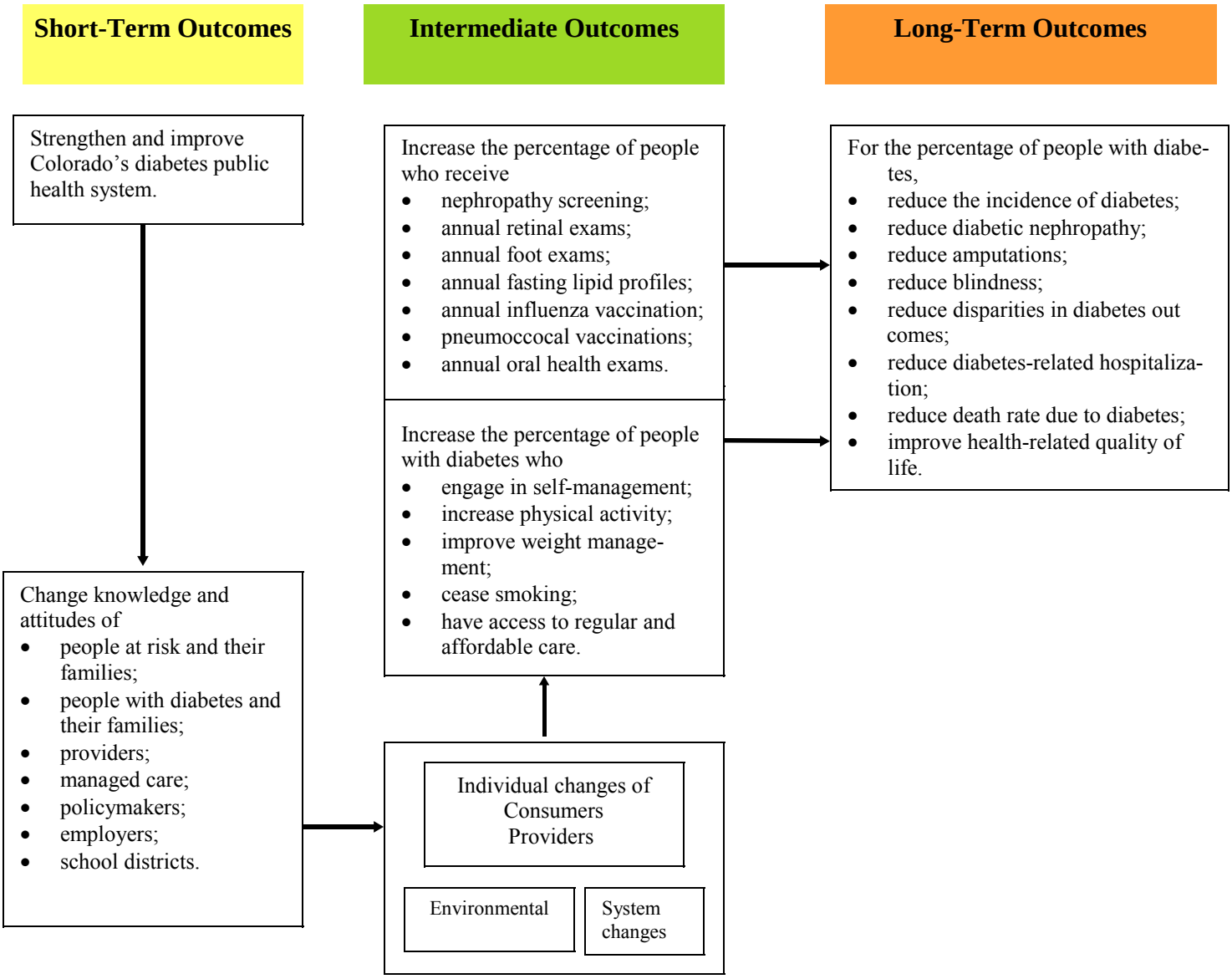
Diabetes Management

Basic diabetes management:
At least 1 HbA1c past 12 months + and at least 1 eye exam past 24 months
Intensive diabetes management:
At least: 2 HbA1c's in past 12 months +, 1 dilated eye exam in past 12 months +, 1 foot exam in past 12 months +, and 1 flu shot in past 12 momths
Basic prediabetes management:
½ of DPP's effect on diabetes incidence (~30% reduction)
Intensive prediabetes management:
Full DPP effect on diabetes incidence (~60% reduction)

Note: The assumption that there will be slowed growth in obesity prevalence over time comes from another system dynamics model project undertaken at CDC and is bolstered by recent evidence from NHANES: *Obesity Among Adults in the United States--No Statistically Significant Change Since 2003-2004*. Data Brief Number 1, November 2007: http://www.cdc.gov/

Colorado Diabetes Prevention and Control Logic Model

(diagram that shows the major components of the program)



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Call to Action

The *Planning for the Future: Colorado Diabetes Prevention and Control Strategic Plan 2007-2010* is a call to action, urging everyone to actively participate in reducing the burden of diabetes in Colorado.

To achieve the goals outlined in this plan, many partners will need to contribute expertise and resources to influence change in systems, communities and individual behaviors. Diabetes is a significant public health problem with substantial human and financial costs. By working together, we can develop a plan to prevent or delay the onset of diabetes in Coloradans and improve care for those living with diabetes.

Ways You Can Help

1. Review the plan. Identify specific areas that your organization can help address.
2. Commit to helping by partnering with the Colorado Diabetes Network and others to prevent and control diabetes.
3. Collaborate with others in your community to leverage resources for diabetes prevention and control.
4. Endorse the plan.

If you are interested in endorsing the Colorado Diabetes Prevention and Control Strategic Plan, please contact the Diabetes Prevention and Control office.

Diabetes Prevention and Control Program
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South, PSD A5
Denver, CO 80246-1530
Phone-English (303) 692-2528 or Toll Free 1(800) 886-7689, ext. 2528
Phone-Spanish (303) 692-2464 or Toll Free 1(800) 886-7689, ext. 2464
Fax (303) 691-7900
E-mail cdphe.psdrequests@state.co.us
Visit our web site at http://www.cdphe.state.co.us/pp/diabetes/index.html

We believe your help in addressing diabetes will make
a notable difference in the lives of Coloradans
with, or at risk for, diabetes.

Glossary

Definition of terms

body mass index: a measure calculated from weight and height that estimates the amount of fat in a body.

blood glucose: the main sugar that the body makes from food we eat. Glucose is carried through the bloodstream to provide energy to all of the body's living cells.

blood glucose meter: a machine used to measure blood glucose from a drop of blood placed on a specially coated strip; can be used by a patient outside of a physician's office or lab.

Behavioral Risk Factor Surveillance System: a national random digit-dialed telephone survey conducted annually in Colorado by the Health Statistics Section, Colorado Department of Public Health and Environment.

diabetes educator: a health-care professional who specializes in teaching people with diabetes how to manage their chronic disease.

glucose: a simple sugar; the body's primary source of energy.

hemoglobin A1c (or more commonly called A1C): a blood test that measures the average blood glucose over a 3– to 4- month period of time; also called glycosylated hemoglobin.

impaired fasting glucose: A condition, determined by a fasting plasma glucose test, in which a person's blood glucose levels are above normal but not high enough to be considered diabetes. It isn't considered a form of diabetes, but people with this condition are at an increased risk for developing diabetes and blood vessel disease. A fasting plasma glucose level of 100 to 125 is considered prediabetes and a fasting plasma glucose level of 126 or above indicates diabetes**.**

impaired glucose tolerance: A condition associated with excessive elevation in blood sugar after a meal but not meeting the criteria for a diagnosis of diabetes. Blood sugar is between 140 milligrams per deciliter (mg/dl) and 199 mg/dl. Also called borderline diabetes and prediabetes.

incidence: the number of new cases of a disease over a specific period of time.

intervention: an activity or program intended to improve outcomes.

morbidity: related to a disease or sickness.

mortality: related to death.

outcome objective: the level to which a health problem is expected to be reduced within a specified period of time; a statement of how the health problem should be affected by the program. An example of an outcome objective is normal cholesterol levels of a patient with diabetes.

Pregnancy Risk Assessment Monitoring System: a surveillance project of the Centers for Disease Control and Prevention (CDC) and state health departments. The system collects state-specific, population-based data on maternal attitudes and experiences, before, during and shortly after pregnancy.

prevalence: the number of people in a given group or population who are reported to have a specific disease at any one point in time.

primary prevention: averting the onset of disease by targeting people who are at high risk.

process objective: the provision of care. An example of a process objective is assessing whether the physician ordered a cholesterol test. A process objective examines only whether the test has been ordered, not whether the cholesterol levels were normal.

retinal eye exam: an eye exam in which the retina, at the back of the eye, is monitored for signs of diabetic retinopathy, which can lead to blindness.

retinopathy: weakening of the blood vessels in the eye, causing them to leak. Leaking blood vessels cause the retina to swell, which can lead to blindness.

risk factor: traits that increase the chance that a person will get an illness. Examples of risk factors for diabetes include age, obesity and genetic heritage.

secondary prevention: curing the disease or halting its progression, including minimizing complications.

self-monitoring of blood glucose: a method for testing the level of glucose in the blood using a blood glucose meter that can be done by the person with diabetes; also called home blood glucose monitoring.

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28. Homer, J., Jones, A., and Klein, D. “Possible Futures of Diabetes in Colorado.” Commissioned by CDC Division of Diabetes Translation, Program Development Branch, Atlanta, Georgia, 2006

Resources

American Diabetes Association
http://www.diabetes.org/home.jsp

Americans with Disabilities Act Homepage
http://www.usdoj.gov/crt/ada/adahom1.htm

Arkansas Department of Health and Human Services Child Health Advisory Committee
http://www.healthyarkansas.com/advisory_committee/advisory.html

Behavioral Risk Factor Surveillance System
http://www.cdphe.state.co.us/hs/brfss/index.html

Bridges to Excellence Program
http://www.bridgestoexcellence.org/

CDC Diabetes Public Health Resource
http://www.cdc.gov/diabetes/

CDC Healthier Worksite Initiative
http://www.cdc.gov/nccdphp/dnpa/hwi/index.htm

Cochrane Collaboration
http://www.cochrane.org/

Colorado Clinical Guidelines Collaborative
http://www.coloradoguidelines.org/

Colorado Community Health Network
http://www.cchn.org/

Colorado Consumer Health Initiative
http://www.cohealthinitiative.org/

Colorado Hospital Association
http://www.cha.com/

Colorado School Districts
http://www.cde.state.co.us/utility/k12schls.htm

Diabetes Advisory Council (Colorado)
http://www.cdphe.state.co.us/pp/diabetes/advisory.html

Diabetes Prevention and Control Program (Colorado)
http://www.cdphe.state.co.us/pp/diabetes/index.html

Dining with Diabetes in Colorado
http://www.cdphe.state.co.us/pp/diabetes/tools.html

Healthy People 2010
http://www.healthypeople.gov/

Institute for Healthcare Improvement: Diabetes
http://www.ihi.org/IHI/Topics/ChronicConditions/Diabetes/

Limited English Proficiency
http://www.LEP.gov/
http://usdoj.gov/crt/cor

MAPP: Mobilizing for Action Through Planning and Partnerships
http:/mapp.naccho.org

National Institute of Diabetes and Digestive and Kidney Disease
http://www.niddk.nih.gov/

National Committee for Quality Assurance Diabetes Physician Recognition Program
http://www.ncqa.org/dprp/

National Diabetes Education Program
http://www.ndep.nih.gov/

National Diabetes Information Clearinghouse
http://diabetes.niddk.nih.gov/

Small Changes Make a Big Difference
http://www.cdphe.state.co.us/pp/diabetes/tools.html

Appendix A: Clinical Guidelines for Adult Diabetes

GUIDELINES FOR ADULT DIABETES CARE

COLORADO CLINICAL GUIDELINES COLLABORATIVE

GUIDELINE	FREQUENCY	GOAL/COMMENTS
HISTORY & PHYSICAL		
Diabetes Focused Visit	Every 3-6 months	More often if needed
Blood Pressure & Weight (BMI)	Every visit	Goal BP <130/80[1], BMI (25-29.9 overweight; ≥ 30 obese)
Retinal Screening	Annually[2]	By ophthalmologist, optometrist, or retinal photograph (read by trained, experienced clinician)
Inspect Feet	Every visit	Without socks and shoes; if abnormal, consider referral to foot care specialist
Comprehensive Lower Extremity Exam	Annually	Vascular, musculoskeletal, neurological exam (w/monofilament)
Oral Health Assessment	Every 6 to 12 months	Refer to dentist or dental hygienist
LABS		
A1c	Quarterly if not meeting treatment goals otherwise at least every 6 months	General Goal <7% A lower goal may be beneficial if no significant risk of hypoglycemia; and if appropriate for patient age, life expectancy, and co-morbidities.
Fasting Lipid Profile	Annually	Goal: LDL <100 mg/dl Optional goal: LDL< 70 in patients with CVD HDL >40 mg/dl for men >50 mg/dl for women Triglycerides <150 mg/dl
Urine Microalbumin	Annually[3] - regardless of therapy	If >30mg/gm creatinine or >30 mg/24hrs initiate ACE-I (ARB if ACE-I intolerant)
Serum Creatinine	Annually	Use to estimate GFR Consider referral to nephrologist if GFR <60
MEDICATIONS/IMMUNIZATIONS (for appropriate patients)		
Aspirin	Initially/Ongoing	In all patients >40 yo or with CVD. May use low dose 81mg/day
ACE Inhibitor (ARB if ACE-I intolerant)	Initially/Ongoing	Individuals with hypertension, microalbuminuria or CVD
Statin	Initially/Ongoing	Use if not at lipid goal. In all patients >40, consider statin irrespective of LDL if baseline total cholesterol ≥135
Influenza Vaccination	Annually	Per CDC recommendations
Pneumococcal Vaccination	At least once	Once; Revaccinate if ≥65 years old, AND first shot at <65 years AND first shot ≥5 years ago
THERAPEUTIC LIFESTYLE CHANGES		
Set Self-management Goals With Patient	Every focused visit	Review and revise as needed
Assess Need for Diabetes Education	Every focused visit	Refer for DM education yearly or prn
Assess Nutrition Status	Every focused visit	Refer for medical nutrition therapy if indicated. Monitor total grams of carbohydrates and limit saturated fat intake.
Assess Exercise Status	Every focused visit	Increase physical activity based on needs/condition
Assess Smoking Status	Initially/Ongoing	Ask, advise, refer to Quitline (1-800-639-QUIT)
Preconception Counseling	Initially/Ongoing	Counsel on contraception and preconception glucose control. Review medication contraindications during pregnancy
Depression Screening	Initially/Ongoing	Treatment and referral as needed

[1] ACE inhibitors should be considered in most hypertensive patients (if no contraindication).

[2] For type 1 do initial comprehensive eye exam 3- 5 years after diagnosis. For type 2 do shortly after diagnosis. Then follow up annually or as directed by eye care provider.

[3] For type 1 begin 5 years after diagnosis and type 2 at diagnosis. If microalbuminuria <30 mg/gm creatinine, screen annually; if 30-300 mg/gm, verify with 2 repeat tests within 3 to 6 months; if >300 mg/gm, evaluate for gross proteinuria.

These clinical guidelines **(revised 04/03/06)** are adapted from the American Diabetes Association (ADA) Standards of Medical Care in Diabetes – 2006 (Diabetes Care, Volume 29, Supplement 1, January 2006). They are designed to assist clinicians in managing adult patients with diabetes and are not intended to replace a clinician's judgment or establish a protocol for all patients with a particular condition.
For references, additional copies of the guidelines, or patient tracking sheets, go to **www.coloradoguidelines.org** or call **720-297-1681**.

Appendix B: Clinical Guidelines for Gestational Diabetes

GUIDELINES FOR GESTATIONAL DIABETES (GDM)

COLORADO CLINICAL GUIDELINES COLLABORATIVE

www.coloradoguidelines.org

SCREENING AND DIAGNOSIS (OGCT = Oral Glucose Challenge Test, 1-hour OGTT = Oral Glucose Tolerance Test, 3-hour)

First Prenatal Encounter: Universal Risk Assessment	High-risk if any of the following: • Advanced maternal age (> 35 y.o.). • Obese (BMI > 29 kg/m² based on ppw). • High-risk ethnic population. • h/o GDM. • Previous macrosomic infant. • h/o GDM related OB complications. • First degree relative w/ diabetes. • PCOS. • Glycosuria.	<u>High-risk:</u> Screen immediately with 50-g, 1-hour OGCT • ≥ 135 mg/dl, follow with 100-g, 3-hour OGTT. If suspect pre-existing diabetes, order HbA1c. • < 135 mg/dl, rescreen between 24–28 weeks. <u>Not high-risk:</u> Follow-up with universal screening between 24–28 weeks.
24–28 Weeks: Universal Screening	Test using 50-g, 1-hour OGCT • ≥ 135 mg/dl, follow with 100-g, 3-hour OGTT. • < 135 mg/dl, no further testing required. See reverse for GDM Screening & Diagnosis Algorithm	**OGTT Diagnostic Criteria for Gestational Diabetes*** If 2 or more values meet or exceed thresholds, diagnose GDM. Note: If only 1 value meets or exceeds thresholds, re-test in 3-4 wks. using OGTT.

Time	mg/dl
Fasting	≥ 95
1-hour	≥ 180
2-hour	≥ 155
3-hour	≥ 140

MEDICAL NUTRITION THERAPY (MNT) AND PHYSICAL ACTIVITY**

Meal Planning	• Educate on healthy food choices and smaller, frequent meals throughout the day. • Teach portion control (plate method or carbohydrate counting) and reading food labels. • Refer to an RD or CDE if available, or an RN or trained community health worker.
Food Record	• Record food and beverage intake including what, amount (cups, etc.), and meal and snack times.
Physical Activity	• Recommend regular physical activity 30 min/day, 5 days/week. • Consult with MD re: any contraindications.

BLOOD GLUCOSE MONITORING

Self-Monitoring Blood Glucose Goals

Time	mg/dl
Fasting	< 95
1-hour pp	< 130–140
2-hour pp	< 120

- Check and record BG 4x/day; fasting and 1 or 2-hours postprandial (pp) for a minimum of 2 weeks.
- Never discontinue SMBG during GDM. Remain vigilant as glucose intolerance increases as pregnancy progresses. If frequency is decreased, rotate SMBG at different meals each day.
- If 20% of BG values exceed the target while following prescribed nutrition and physical activity plan, consider medication therapy.

MEDICATION MANAGEMENT

Oral	• Glyburide is the only oral hypoglycemic agent that may be considered as an alternative to insulin. • Metformin should not be initiated in pregnancy. If used to manage PCOS risks, discontinue after 1st trimester.
Insulin	• Use SMBG to guide the doses and timing of the insulin regimen. • Aspart and Lispro are the most effective at reducing postprandial glycemic excursions. • Regular and NPH have also been used safely in pregnancy.

PRENATAL SURVEILLANCE AND DELIVERY MANAGEMENT

Surveillance	• A fetal based strategy (AC > 75th%ile at 28–33 weeks) may help identify women that may benefit from more intensive medical management. • Prenatal surveillance may include NST, AFI, Biophysical Profile or Contraction Stress Test. Selection of the prenatal test is at the discretion of the practitioner.
Diet Controlled**	• Euglycemic: initiate surveillance at 40 weeks. • Not euglycemic: initiate surveillance at 36 weeks.
Medication Controlled	• If pregnancy is not otherwise complicated, initiate surveillance at 32–34 weeks.
Delivery	• There is no data to support delivery at < 38 wks or cesarean delivery purely on the basis of GDM.

POSTPARTUM FOLLOW-UP

Due to the increased risk of developing type 2 diabetes, it is **crucial** that women return to their provider to receive the appropriate postpartum counseling, testing, and follow-up after a GDM pregnancy. See reverse for GDM Postpartum Algorithm.

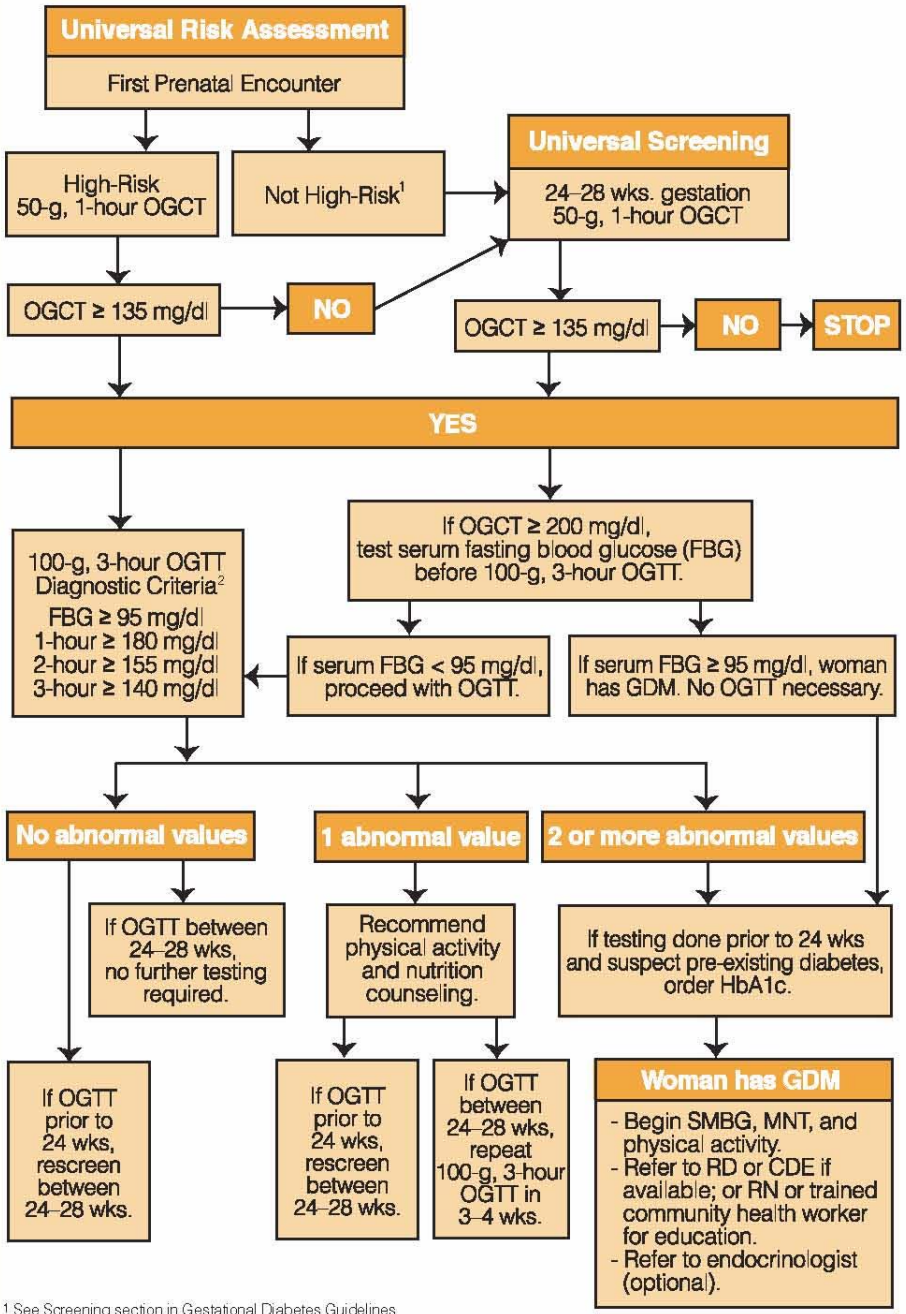
These clinical guidelines (approved 9/12/2006) are adapted from the *American Diabetes Association (ADA) Standards of Medical Care in Diabetes—2006*. They are designed to assist clinicians in managing women with gestational diabetes and are not intended to replace a clinician's judgment or establish a protocol for all women with gestational diabetes. For references, important updates, additional copies of guidelines, go to **http://www.coloradoguidelines.org** or call **720-297-1681** or **1-866-401-2092.**

* American Diabetes Association, Carpenter and Coustan criteria.

** For more specific GDM nutrition information, visit the Gestational Diabetes Nutrition Guidelines at **http://www.cdphe.state.co.us/pp/diabetes/tools.html**.

Colorado Department of Public Health and Environment

Gestational Diabetes Screening and Diagnosis



1 See Screening section in Gestational Diabetes Guidelines
2 American Diabetes Association, Carpenter and Coustan

Gestational Diabetes Postpartum Follow-up

Women with GDM have an approximate 50% risk for developing type 2 diabetes within the next 5–10 years and 80% risk if they have impaired fasting glucose or impaired glucose tolerance postpartum. Therefore it is crucial they return to their provider to receive the appropriate postpartum counseling, testing, and follow-up after a GDM pregnancy.

6-12 Weeks Postpartum

75-g, 2-hour OGTT with fasting and 2-hour results

Reclassification Criteria for Postpartum Maternal Glycemic Status

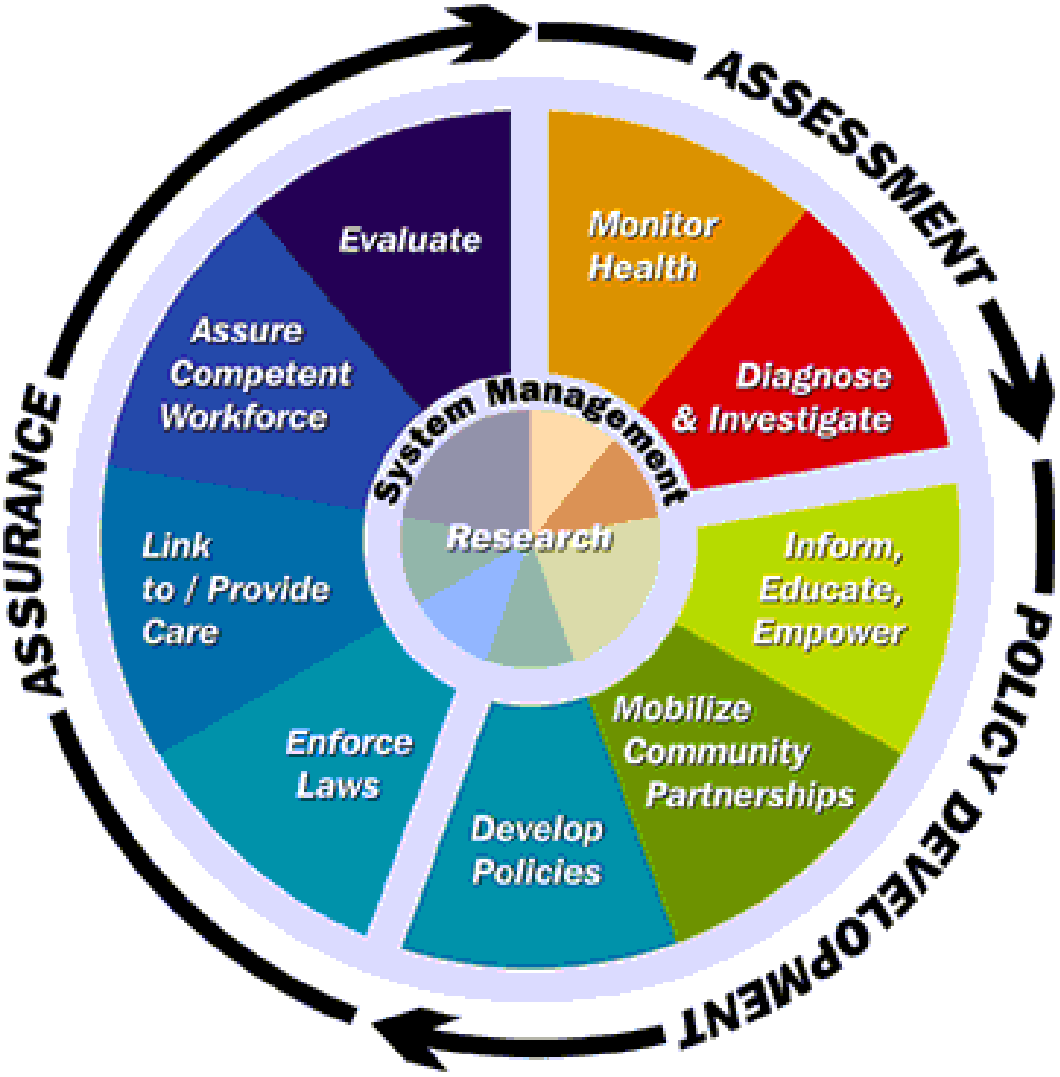
Time	Normoglycemia	Pre-diabetes	Type 2 Diabetes Mellitus
Fasting	< 100 mg/dl	≥ 100 mg/dl and < 126 mg/dl Impaired Fasting Glucose (IFG)	≥ 126 mg/dl
2-hour	< 140 mg/dl	≥ 140 mg/dl and < 200 mg/dl Impaired Glucose Tolerance (IGT)	≥ 200 mg/dl

Normoglycemia	Pre-diabetes (IFG or IGT)	Type 2 Diabetes Mellitus
Reassess glycemia at minimum of 1–3 yr. intervals.	• Test blood glucose for diabetes annually. • Refer to primary care physician. • Advise to continue MNT. • Encourage physical activity.	Refer to providers for diabetes self-management education and treatment.

Postpartum education for all women with prior GDM:

- Encourage lifestyle modifications to improve insulin resistance, maintain normal body weight, make healthy food choices, increase physical activity.
- Recommend breastfeeding as it may decrease maternal progression to type 2 diabetes following a GDM pregnancy.
- Educate on effective contraception and the need for preconception counseling and evaluation **before** future pregnancies.
- Emphasize importance of a healthy lifestyle in children born to women with GDM.
  - Monitor for development of obesity and/or glucose intolerance.
  - Encourage daily physical activity.
  - Teach and model healthy eating habits.

Appendix C: Ten Essential Public Health Functions

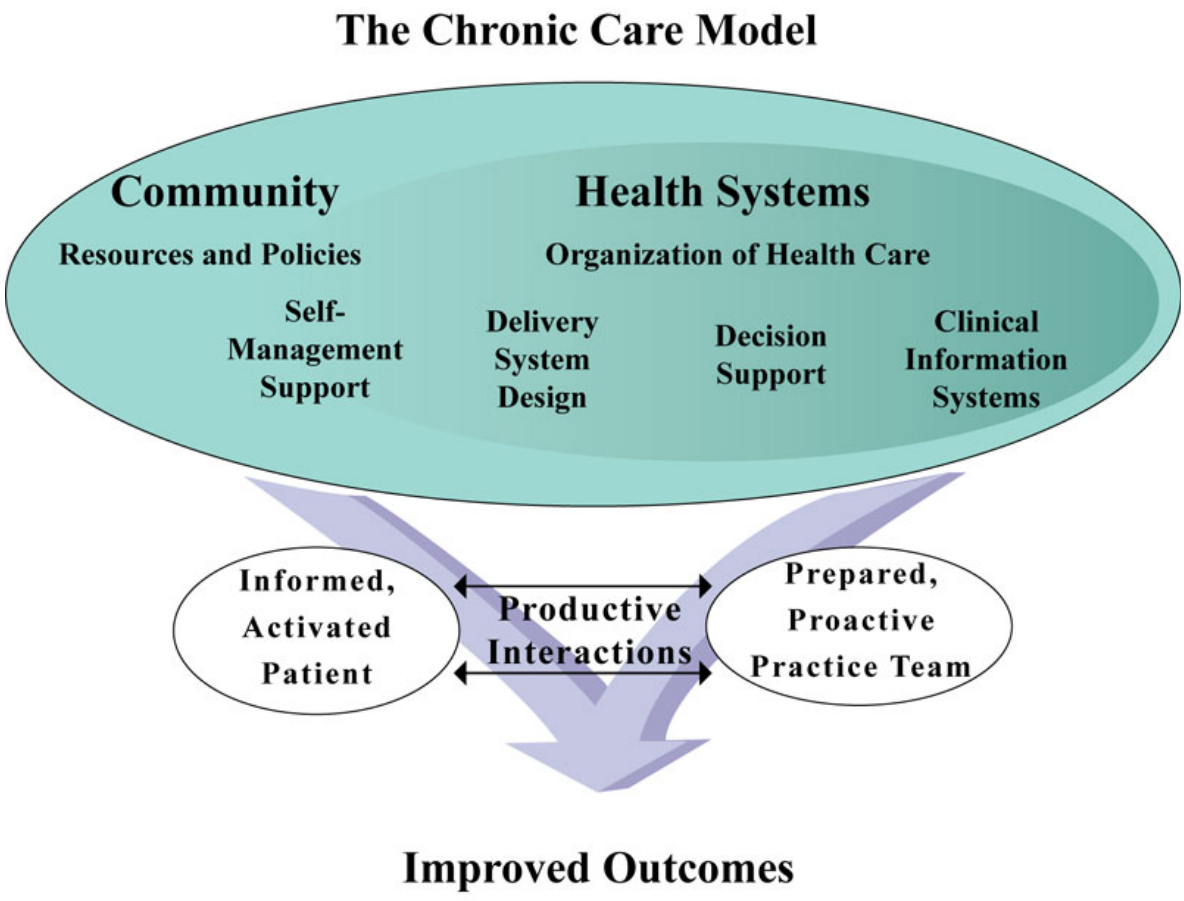


Source: Public Health Functions Steering Committee, Members (July 1995): American Public Health Association, Association of Schools of Public Health, Association of State and Territorial Health Officials, Environmental Council of the States, National Association of County and City Health Officials, National Association of State Alcohol and Drug Abuse Directors, National Association of State Mental Health Program Directors, Public Health Foundation, U.S. Public Health Service.

Appendix D: Theme of the Planned (or Chronic) Care Model

An organizational approach to caring for people with chronic disease in a primary care setting. The system is population-based and creates practical, supportive, evidenced-based interactions between an informed, activated patient and a prepared, proactive practice team.

Concept Design for a System of Care for Chronic Illness



Six Components of the Planned Care Model: Healthcare Organization, Community Resources and Policies, Self-management Support, Decision Support, Delivery System Design (Practice Redesign), Clinical Information Systems

Source: http://www.improvingchroniccare.org

Appendix E: Relationship between DAC, DPCP, and CDN

Diabetes Advisory Council

The Diabetes Advisory Council (DAC) shares individual perspectives and experiences while advising the Colorado Diabetes Prevention and Control Program and the Colorado Diabetes Network. It's mission is to support and promote a comprehensive system of evidence-based community and healthcare services to reduce or delay the onset of diabetes and its complications, and to enhance the quality of life of persons affected by diabetes.

Diabetes Prevention and Control Program

The DPCP is totally funded by the Centers for Disease Control and Prevention through a competitive grant process. The DPCP has four goals

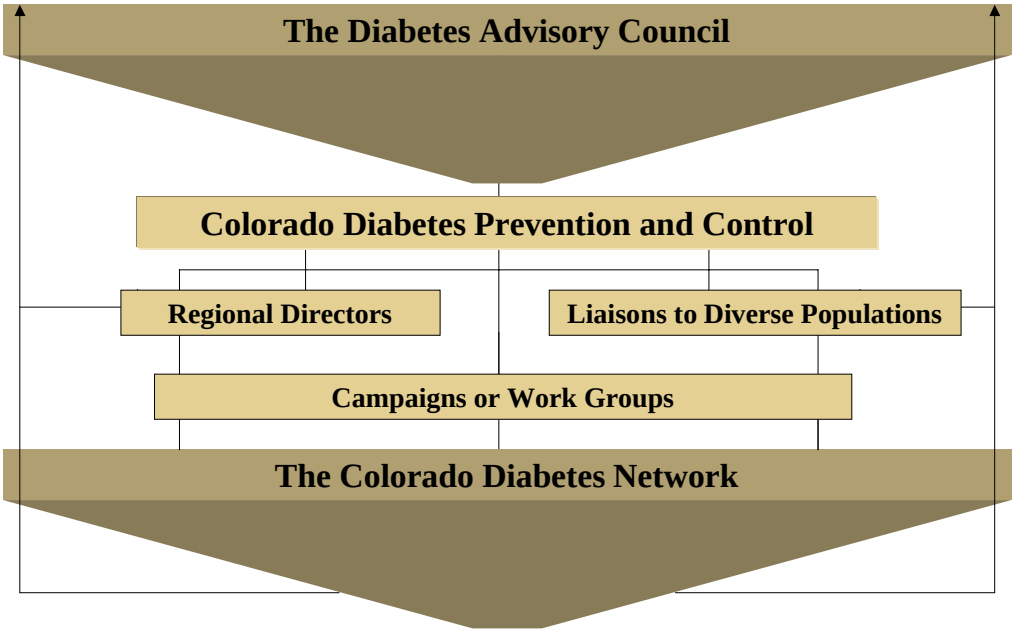
1) Eliminate Diabetes Related Health Disparities,
2) Prevent Diabetes,
3) Prevent Complications, Disabilities, and Reduce the Burden of Diabetes, and
4) Maximize Organization Capability and it's mission is to:

*Promote and facilitate the exchange of diabetes data and information to assist in program planning, implementation, and evaluation.

*Develop the capacity of statewide partners by providing guidance in leadership and resource development.

Colorado Diabetes Network

Membership is free and open to anyone working to prevent and control diabetes. The Colorado Statewide Diabetes Network (CSDN) is made up of organizations and people working in public, private, tribal, community and academic/training sectors and is supported by the Colorado Diabetes Prevention and Control Program. Members of the Diabetes Network work to address one or more of the goals of the Colorado State Diabetes Plan.



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Authors
Risha Gidwani, graduate student intern
Dale Rogoff Greer, RN, MPH, CPHQ
Cassidy Smith, MPH
Gloria Vellinga, RD, CDE
Rickey Tolliver, MPH

Colorado Diabetes Prevention and Control Program
Michelle Hansen, MS, RD, CDE
Program Manager

Gloria Vellinga, RD, CDE
Community Health Coordinator

MariaElena Carreón Ayers, BS
Outreach Coordinator

Colorado Diabetes Advisory Council
Marc-Andre Cornier, MD
Chair

Eric Albright, MD, FACE, PC
Past Chair

Julie A. Marshall, PhD
Past Chair

Contributors
Kirk Bol, MSPH
Alice Bradley, MA
Terry Bryant, MS
Wenfang Muhr, MS
Andrea Poniers, MSW, MPH
Kieu Vu, MSPH
Chris Wells, MS

Diabetes Prevention and Control Program
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South, PSD A5
Denver, CO 80246-1530

Phone-English (303) 692-2528 or Toll Free 1(800) 886-7689, ext. 2528
Phone-Spanish (303) 692-2464 or Toll Free 1(800) 886-7689, ext. 2464

Fax (303) 691-7900

E-mail cdphe.psdrequests@state.co.us

Visit our website at http://www.cdphe.state.co.us/pp/diabetes/index.html