Employers' Diabetes Costs Calculator: Overview of Methodology

Prepared for:

The Agency for Healthcare Research and Quality

Prepared by:

The Lewin Group, Inc.

March 15, 2006

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I. Overview

A. High Cost of Diabetes

According to the Centers for Disease Control and Prevention, 18.2 million Americans have diabetes, which is the sixth leading cause of death in the US and a leading contributor to such long-term medical conditions as heart disease, hypertension and blindness.[1] The economic impact of diabetes is enormous. In 2002, diabetes accounted for $132 billion in combined direct and indirect health care expenditures, including $91.8 billion in direct medical expenditures and $39.8 billion in indirect costs associated with mortality, permanent disability, lost workdays and restricted activity days.[2] Diabetes is estimated to be the eighth most costly health care condition in the US.[3]

B. Project Purpose

The Agency for Healthcare Research and Quality (AHRQ), the lead federal agency that supports research designed to improve the quality, safety, efficiency and effectiveness of health care for all Americans, has established a learning collaborative of regional business coalitions on health and a state health department on diabetes quality improvement. The learning collaborative grew out of a partnership established between AHRQ and the National Business Coalition on Health (NBCH), which offers expertise in employer-driven quality improvement. In each of the communities, AHRQ is helping the learning collaborative participants develop tailored quality improvement goals and strategies that build on their strengths and local opportunities. In the mid-Atlantic region, AHRQ is working with employers and plans to identify opportunities to improve health plans' performance on diabetes management using eValue8 data and to build performance guarantees for diabetes management into their contracts. In Memphis, AHRQ is working with the coalition to design a local team-based approach to managing diabetes and to assist employers with selecting and evaluating disease management vendors. AHRQ is helping the coalition in Southeastern Michigan to build the diabetes component of a community-wide multi-stakeholder Save Lives Save Dollars initiative to improve health care quality and reduce health care costs. Though the strategies employed by each of the communities varies according to its needs, all of the strategies are being developed and implemented with broad support involving multiple stakeholders.

C. Diabetes Calculator Overview

At the request of one of the employer coalitions, the Mid-Atlantic Business Group on Health, The Lewin Group (Lewin) developed a tool (a diabetes calculator) to assess the potential return on investment to employers of improving the quality of diabetes care. The tool provides employers with a rough estimate of the prevalence of diabetes within their covered employees and dependents, the cost of diabetes to the organization and the potential costs and savings associated

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1 Centers for Disease Control and Prevention. National Diabetes Statistics Fact Sheet: www.cdc.gov/diabetes/pubs/pdf/ ndfs_2005.pdf.

2 Hogan P, Dall T, Plamen N. Economic Costs of Diabetes in the U.S. in 2002 Diabetes Care 26:917–932, 2003. Available online: http://care.diabetesjournals.org/cgi/reprint/26/3/917.pdf

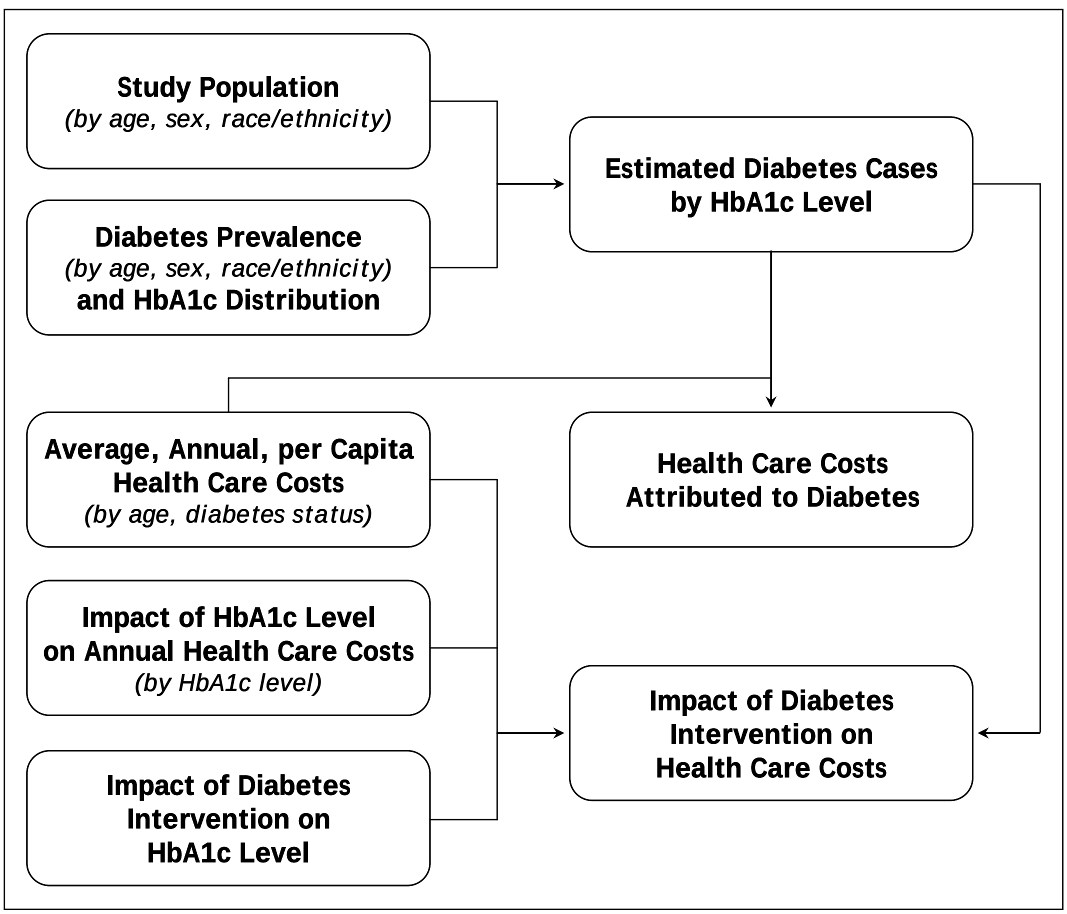
3 Druss BG, Marcus SC, Olfson M, Pincus HA. The most expensive medical conditions in America. Health Affairs 2002;21:105-11.

with implementing interventions to improve the quality of diabetes care. The tool is intended to help employers establish a business case for diabetes quality improvement.

The diabetes calculator provides public and private employers a rough estimate of their health care costs associated with diabetes and of the excess costs that are associated with poor control of blood glucose. The result reflects the potential for savings that might be realized from a carefully designed disease management program for diabetes care. AHRQ staff and external experts have reviewed a preliminary version of the calculator; additional reviews and beta-testing by users will be conducted in 2006 and further refinements may be made.

The diabetes calculator combines demographic information on a covered population with diabetes prevalence rates to estimate the number of people with diabetes. The calculator contains estimates of average, annual per capita health care costs for people with and without diabetes to estimate annual health care costs attributed to diabetes and it combines information on the HbA1c level distribution of people with diabetes, the impact of HbA1c level on annual health care costs and the impact of diabetes interventions on HbA1c level to estimate the potential savings from disease management and other interventions (**Exhibit 1**). In the remainder of this paper we summarize each of the major components of the diabetes calculator.

Exhibit 1:
Diabetes Calculator Overview



II. Estimating the Number of People with Diabetes

The diabetes calculator estimates the number of people with diabetes based on user inputs and information from a variety of sources. For the state snapshots of the National Healthcare Quality Report (NHQR), estimating diabetes prevalence involves calculating:

a) Number of covered lives of state government employees and their dependents by age, sex, and race/ethnicity and state

b) Diabetes prevalence by age, sex and race/ethnicity based on national diabetes prevalence rates for these subgroups

A. Number of Covered Lives

1) Number of State Employees by Age, Sex and Race/Ethnicity

Estimates of the number and demographics of state employees were provided to Lewin by Thomson/Medstat. Because there is no one source that provided all the needed data, Thomson/Medstat obtained this information from a variety of sources.

The total number of state government employees was obtained from the Bureau of Labor Statistics, 2004 Quarterly Census of Employment and Wages (QCEW).[4] To obtain the number of state government employees by age, the age distribution of the employed population in the state was estimated from the Bureau of Labor Statistics' Current Population Survey (CPS), averaged over three years (2003-2005), then applied to the QCEW data.[5]

Data on the race/ethnicity and sex distribution came from two main sources, US Census Equal Employment Opportunity (EEO) Data Tool and US Census state population estimates. The EEO database provided race/ethnicity data for state government employees in cities with a minimum population of 100,000.[6] The distribution of these employees by race/ethnicity was applied to all state government workers to obtain state-wide counts of employees by race/ethnicity. When EEO data were missing for the state, the race/ethnicity distribution was taken from the Census data for the state's entire population.[7] This was done for Alabama, Alaska, Florida, Illinois, Indiana, Kansas, Kentucky, Maryland, Michigan, Missouri, Nevada, New Jersey, New Mexico, New York, Tennessee and Washington. For Hawaii, approximately 20%of the state's population was missing using Census race categories in the EEO data tool which did not include the mixed race category. To account for people of mixed race, Claritas race data was used.[8] The race/ethnicity distribution was assumed to be the same for males and females.

The race/ethnicity and sex distributions then were applied to the estimated number of state government employees by age to give the number of state government employees by age, sex and race/ethnicity for each state.

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4 Bureau of Labor Statistics Quarterly Census of Employment and Wages 2004: http://www.bls.gov/cew/home.htm

5 Current Population Survey, Annual Social and Economic Supplement 2003, 2004, 2005)

6 2000 US Census Bureau: Census 2000 EEO Data Tool: http://www.census.gov/eeo2000/index.html).

7 US Census 2004 at http://www.census.gov/popest/states/asrh/SC-EST2004-03.html

8 Claritas, Inc. 2001 Demographic Data and the Claritas Demographic Update Methodology, May 2001.

2) Number of Dependents

To estimate the number of state government employees who have dependents covered by their health insurance, the model estimates employees that select family coverage and have children. Estimates of the percent of employees that select family coverage were based on AHRQ Medical Expenditure Panel Survey (MEPS) data.[9] **Exhibit 2** lists the percent of employees that take family coverage by the industry and size of the firm in which they are employed. Because government was not one of the employment sectors listed, for the population of state government employees, we used estimates from the Other Services sectors. As all states have more than 1,000 employees, we used an estimate of 35.5% of employees with family coverage.

Exhibit 2:
Percent of Employees Enrolled in a Health Insurance Plan that take Family Coverage by Firm Size and Selected Characteristics

Industries Used in Calculator	< 10 Employees	10-24 Employees	25-99 Employees	100-999 Employees	1000+ employees
Manufacturing	32.0%	34.0%	34.8%	42.8%	46.6%
Construction	40.3%	29.9%	38.0%	39.2%	38.1%
Trade, transportation and utilities	35.7%	26.1%	35.0%	38.8%	42.3%
Professional and business services	30.4%	25.5%	25.6%	29.3%	37.6%
Other Services[10]	33.6%	27.6%	24.8%	28.7%	35.5%

Source: AHRQ Medical Expenditure Panel Survey data: http://www.meps.ahrq.gov/papers/ st90/stat90.pdf

The number of children per employee that selects family coverage was based on state averages from the US Census Bureau.[11] **Exhibit 3** lists the average number of children (under 18) per family with children by state according to data from the 2000 Census. The distribution of children by race/ethnicity is assumed to be the same as the race/ethnicity distribution of state government employees.

9 AHRQ Medical Expenditure Panel Survey data: http://www.meps.ahrq.gov/papers/st90/stat90.pdf
10 Other Services includes Government, Leisure and Hospitality and Education and Health Services.
11 2000 US Census Bureau: www.census.gov/population/socdemo/hh-fam/tabST-F1-2000.pdf

Exhibit 3:
Average Number of Children per Family with Children by State

State	Average per Family with Children	State	Average per Family with Children
Alabama	1.8	Montana	1.9
Alaska	2.0	Nebraska	1.9
Arizona	2.0	Nevada	1.9
Arkansas	1.8	New Hampshire	1.8
California	2.0	New Jersey	1.8
Colorado	1.8	New Mexico	1.9
Connecticut	1.8	New York	1.9
Delaware	1.8	North Carolina	1.8
District of Columbia	1.8	North Dakota	1.9
Florida	1.8	Ohio	1.9
Georgia	1.8	Oklahoma	1.8
Hawaii	1.9	Oregon	1.9
Idaho	2.0	Pennsylvania	1.9
Illinois	1.9	Rhode Island	1.8
Indiana	1.9	South Carolina	1.8
Iowa	1.9	South Dakota	2.0
Kansas	1.9	Tennessee	1.8
Kentucky	1.7	Texas	1.9
Louisiana	1.8	Utah	2.2
Maine	1.8	Vermont	1.8
Maryland	1.8	Virginia	1.8
Massachusetts	1.8	Washington	1.9
Michigan	1.9	West Virginia	1.7
Minnesota	1.9	Wisconsin	1.9
Mississippi	1.8	Wyoming	1.9
Missouri	1.8		

Source: US Bureau of the Census, Census 2000 Summary File 1 (SF 1) 100-Percent Data, Tables P34 "Family Type by Presence and Age of Own Children" and P36 "Own Children Under 18 Years by Family Type and Age."

B. Diabetes Prevalence Rates

The calculator estimates the total number of people diagnosed with diabetes by applying national diabetes prevalence rates (by age, sex and race/ethnicity) to the population of state employees and their dependents.

To estimate the covered lives with diabetes, the national diabetes prevalence rate was applied to the number of covered lives by state, described above. These prevalence rates were calculated using combined files from the 1998, 1999 and 2000 files of the National Health Interview Survey, with prevalence rates stratified by age, sex and race/ethnicity.[12] These rates were calculated by

12 1998, 1999, 2000 files of the National Health Interview Survey: http://www.cdc.gov/nchs/nhis.htm

Hogan et al. (2003) for a study for the American Diabetes Association on the national cost of diabetes.[13] These prevalence rates were calculated by combining three years' worth of NHIS files created larger samples with which to estimate separate prevalence rates for each of 12 age-groups by sex and by four race/ethnicity designations. The 12 age categories are 0–17, 18–24, 25–29, 30–34, 35–39, 40–44, 45–49, 50–54, 55–59, 60–64, 65–69 and 70+ years, and these age categories were combined into four age categories for use in the diabetes calculator (0–17, 18–44, 45–64, 65 and older). The four race/ethnicity categories are Hispanic, non-Hispanic white, non-Hispanic black and non-Hispanic other.

The NHIS collects data on 43,000 households of more than 106,000 people annually. The combined files for 1998–2000 create a sample of more than 320,000 people. People with diabetes are identified using the survey question that asks whether the survey participant has been told by a doctor that he or she has diabetes (other than gestational diabetes). Responses to the question are coded as "yes," "no," "borderline" and "no response." People responding "yes" are coded as having diabetes. People responding "borderline" are not counted as having diabetes in this analysis.

Prevalence rates vary substantially by race and ethnicity. They are higher for Hispanics and non-Hispanic blacks than for non-Hispanic whites. Furthermore, the rates for other populations (i.e., Asian Americans, American Indians, Pacific Islanders, etc.) are similar to those of non-Hispanic whites among females, but are higher than the rates for non-Hispanic whites among males.

The NHIS data is based on self-reported prevalence of diabetes only; therefore, it does not account for the considerable number of people with diabetes who are unaware that they have the disease or do not report it. The total number of covered lives with undiagnosed diabetes was estimated by multiplying the total prevalence estimate by 42%, the factor suggested by the 2005 National Diabetes Statistics Fact Sheet, produced by the CDC, that reports that for every 100 people diagnosed with diabetes there are approximately 42 people with diabetes that have not yet been diagnosed.[14] For the cost calculations, we assume that per capita health care costs for people with undiagnosed diabetes are similar to per capita health care costs for similar people without diabetes.

C. Baseline Medical Costs

Estimates of average, per capita health care expenditures for privately insured people with and without diabetes (**Exhibit 4**) were calculated by combining information from: a) The Lewin Group's Health Benefits Simulation Model (HBSM,)[15] b) an American Diabetes Association

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13 Hogan P, Dall T, Plamen N. Economic Costs of Diabetes in the U.S. in 2002 Diabetes Care 26:917–932, 2003. Available online: http://care.diabetesjournals.org/cgi/reprint/26/3/917.pdf

14 Centers for Disease Control and Prevention. National Diabetes Statistics Fact Sheet: www.cdc.gov/diabetes/pubs/pdf/ ndfs_2005.pdf

15 The Health Benefits Simulation Model (HBSM) is a microsimulation model of the US health care system. HBSM is based upon a representative sample of households in the US, which includes information on the economic and demographic characteristics of these individuals as well as their utilization and expenditures for health care. The HBSM household data are based upon AHRQ's 1999 through 2001 MEPS, which were used together with the March 2004 Current Population Survey. The data were adjusted to show the amount of health spending by type of service and source of payment as estimated by the office of the Actuary of the Centers for Medicare and Medicaid Services (CMS) and various agencies. More information on the HBSM data and methods are available in: Sheils J, Haught R. Covering America: cost and coverage analysis of ten proposals to expand health insurance coverage. Appendix A: Health Benefits Simulation Model (HBSM): uniform methodology and assumptions. October 1, 2003. Available online: http://www.rwjf.org/files/research/costCoverageMethodology.pdf

study by Hogan et al. (2003)[16] that found that people with diabetes have health care costs approximately 2.4 times the cost of similar people without diabetes; c) estimates of the prevalence of diabetes for different age groups based on an analysis of the 1999-2001 National Health Interview Survey; d) the Medical Care Component of the Consumer Price Index (CPI) to update the estimates to current year dollars; and e) the Council for Community Economic Research's (ACCRA, September 2005) [17] Cost of Living Index that provides a cross-state comparison of health care costs (**Exhibit 5**).

Exhibit 4:
Baseline Per Capita Annual Health Care Costs

Age	Annual Cost of Care for Individuals with Diabetes *(COL adjusted)*	Annual Cost of Care for Individuals without Diabetes
<18	$4,140	$1,725
18-44	$6,760	$2,817
45-64	$11,465	$4,777
65+	$11,653	$4,855

Exhibit 5:
Cross-state Health Care Cost Index

State	Health Care Cost Index	State	Health Care Cost Index
Alabama	87.1	Montana	101.4
Alaska	138.8	Nebraska	88.5
Arizona	102.6	Nevada	109.8
Arkansas	90.1	New Hampshire*	115.5
California	115.6	New Jersey	107.9
Colorado	103.1	New Mexico	104.0
Connecticut	123.2	New York	106.7
Delaware	103.6	North Carolina	106.1
District of Columbia	116.1	North Dakota	95.2
Florida	103.5	Ohio	96.6
Georgia	99.4	Oklahoma	93.7
Hawaii	110.2	Oregon	107.8
Idaho	100.4	Pennsylvania	98.0
Illinois	98.1	Rhode Island	114.3
Indiana	98.2	South Carolina	101.1
Iowa	93.4	South Dakota	90.9
Kansas	91.2	Tennessee	92.7
Kentucky	93.6	Texas	97.4
Louisiana	97.0	Utah	92.2
Maine*	115.5	Vermont	104.0

**Information for individual state unavailable, regional average used instead.*

16 Hogan P, Dall T, Plamen N. Economic Costs of Diabetes in the U.S. in 2002 Diabetes Care 26:917–932, 2003. Available online: http://care.diabetesjournals.org/cgi/reprint/26/3/917.pdf

17 http://www.coli.org/

State	Health Care Cost Index	State	Health Care Cost Index
Maryland	110.5	Virginia	100.8
Massachusetts	117.6	Washington	117.9
Michigan	95.6	West Virginia	92.3
Minnesota	102.6	Wisconsin	100.7
Mississippi	95.5	Wyoming	97.8
Missouri	94.2		

Source: Council for Community Economic Research's (ACCRA, September 2005).

A review of the literature identified no current estimates of health care costs for people with and without diabetes for the privately insured population. Consequently, cost estimates were calculated using the following steps:

1) Estimates of the average, per capita health care costs for each of four age groups (C_{A1}, C_{A2}, C_{A3}, and C_{A4}) were obtained from the HBSM.

2) Based on the Hogan et al. (2003) estimate that health care expenditures for people with diabetes (C_D) are 2.4 times the cost of similar people without diabetes (C_{ND}) and estimates of the prevalence of diabetes for each of four age groups (P_{A1}, P_{A2}, P_{A3}, and P_{A4}), the average health care cost for people in each age group with diabetes and without diabetes was calculated using the following equations:

$$C_{D,Ai} = 2.4 \times C_{ND,Ai} \quad \text{and} \quad C_{Ai} = P_{Ai} \times C_{D,Ai} + (1 - P_{Ai}) \times C_{ND,Ai};$$

therefore,

$$C_{D,Ai} = \frac{2.4 \times C_{Ai}}{1.4 \times P_{Ai} + 1}$$

III. HbA1c Level as Marker of Health Care Status

The calculator estimates the impact of disease management and other interventions on Hemoglobin A1c (HbA1c) levels, which is an important and widely accepted indicator of the health status of people with diabetes. Measurement of HbA1c is the gold standard method for long-term monitoring of glycemic control in people with diabetes. Improvements in glycemic control lead to increased cognitive functioning, general perceived health, less symptom distress and lower rates of depression and detachment.[18] Poor glycemic control in people with diabetes is associated with microvascular complications, including kidney, eye and nerve disease.[19, 20] HbA1c is the only laboratory test validated through RCTs to be a predictor of risk for these complications.[21]

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18 Testa MA,. Simonson DC. Health economic benefits and quality of life during improved glycemic control in patients with type 2 diabetes mellitus: a randomized, controlled, double-blinded trial. JAMA 1998;280:1490-6.

19 Stratton IM, Adler AI, Neil HAW, et al. Association of glycaemia with macrovascular and microvascular complications of type 2 diabetes (UKPDS 35): prospective observational study. *Br Med J.* 2000;321:405-412.

20 Centers for Disease Control and Prevention. National Diabetes Fact Sheet, United States, 2003. Available online: http://www.cdc.gov/diabetes/pubs/pdf/ndfs_2003.pdf

21 Management of diabetes mellitus in the primary care setting. Washington, DC: Department of Veterans Affairs, 1999.

HbA1c was selected for use in the calculator as a marker for health status, because much of the available evidence base on effectiveness of diabetes management interventions focuses on the impact of the interventions on glycemic control. A recent AHRQ evidence-based practice report examined the impact of quality improvement interventions on HbA1c levels in people with diabetes.[22] There also is a limited body of literature on the cost of care associated with different HbA1c levels in people with diabetes. Combining the findings from the AHRQ evidence report and the literature associating HbA1c level with cost of care allowed us to create an estimate of the possible cost impact of interventions that affect HbA1c levels.

HbA1c also is a convenient marker to use in a calculator intended for an employer audience, because there is data available to employers on health plans' performance on HbA1c testing rates and lab values for their members through the National Committee on Quality Assurance Health Plan Employer Data and Information Set (HEDIS). As the calculator is intended as a decision-making and management tool for use by employers, it is of most use to them if the tool provides estimates of projected outcomes that they will be able to measure. Blood pressure is another important marker of the health status of people with diabetes, but data on blood pressure test results may not be widely available to employers.

A. HbA1c Level Distribution

The distribution of HbA1c levels for diabetic employees was estimated by fitting the employee population to the distribution of HbA1c levels in the CDC National Health and Nutrition Examination Survey (NHANES) data (2001-2002).[23] The distribution is based on the reported HbA1c levels of respondents who either: a) have been told by their physician that they have diabetes and had HbA1c levels greater than six; or b) have not been told by their physician that they have diabetes or have been told that they are borderline diabetic and had HbA1c levels greater than seven. The distribution of HbA1c levels among respondents who were diagnosed with diabetes or told that they were borderline diabetic is presented in **Exhibit 6**.

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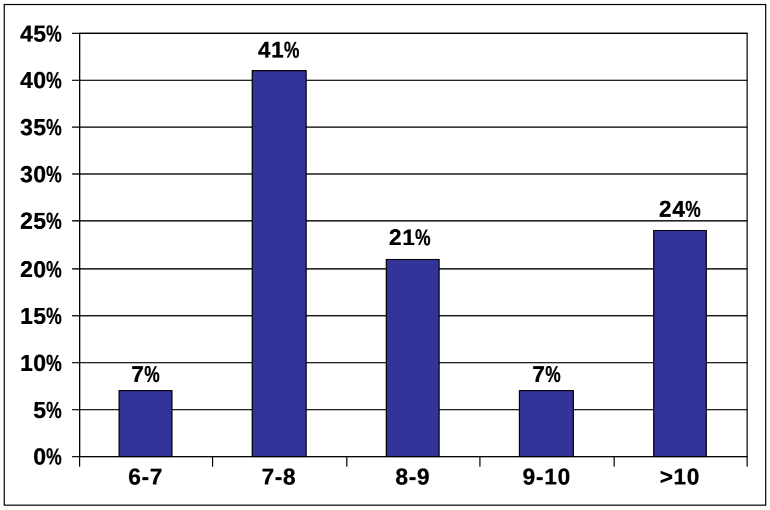
22 Shojania KG, Ranji SR, Shaw LK, Charo LN, Lai JC, Rushakoff RJ, McDonald KM, Owens DK. Diabetes Mellitus Care. Vol. 2 of : Shojania KG, McDonald KM, Wachter RM, Owens DK. Closing The Quality Gap: A Critical Analysis of Quality Improvement Strategies. Technical Review 9 (Contract No. 290-02-0017 to the Stanford University–UCSF Evidence-based Practice Center). AHRQ Publication No. 04-0051-2. Rockville, MD: Agency for Healthcare Research and Quality. September 2004.

23 Centers for Disease Control and Prevention. National Health and Nutrition Examination Survey data. Source: http://www.cdc.gov/nchs/about/major/nhanes/nhanes01-02.htm

Exhibit 6:
Distribution of HbA1c Levels among NHANES Respondents with Diabetes



B. Medical Costs by HbA1c

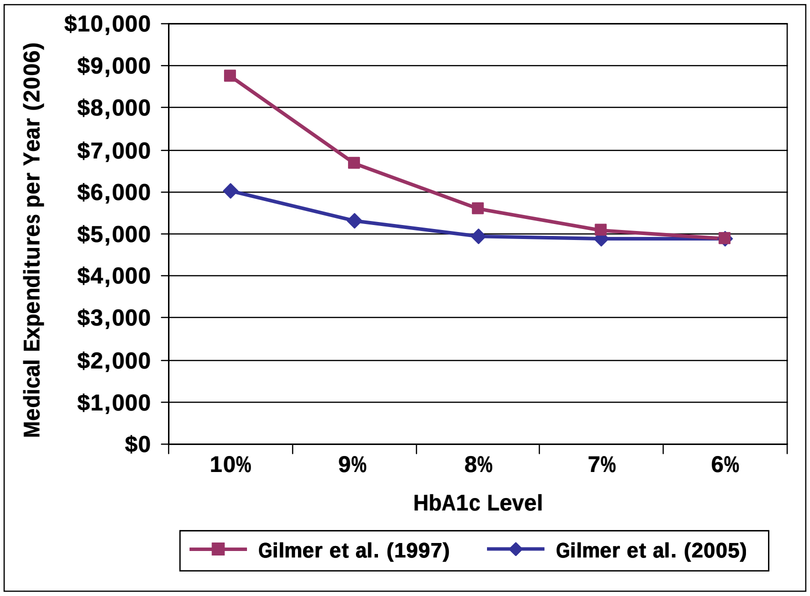
Our review of the literature identified no studies that use longitudinal data to quantify how changes in a person's HbA1c level impact medical expenditures. We did identify two studies (Gilmer et al., 1997 and Gilmer et al., 2005) that estimate how medical expenditures differ across people with different HbA1c levels controlling for other determinants of medical expenditures. [24]

Both studies use data on medical expenditures of patients with diabetes in a large commercial health plan for three years and analyzed the difference in health care costs for patients that started the study period at different HbA1c levels. Neither study reevaluated the HbA1c levels of the study subjects at the end of the three years. Thus, the estimates of lower costs associated with better glycemic control assume that changes in HbA1c levels lead to fewer complications that result in lower costs.

Both studies find that people with lower HbA1c levels have lower medical expenditures compared to similar people with higher HbA1c levels. The 1997 study shows a much stronger relationship than does the 2005 study (**Exhibit 7**). Part of this difference might be explained by methodological differences between the two studies, while part of the difference might be explained by changes over time in patterns of care and improved medications to control for HbA1c level. In this study we use the estimates from the 2005 study.

[24] Gilmer TP, O'Conner PJ, Rush WA, Crain AL, Whitebird RR, Hanson AM, and Solberg LI: Predictors of Health Care Costs in Adults With Diabetes. Diabetes Care 28(1): 59-64, 2005.

Exhibit 7:
Estimated Relationship between Annual, per Capita Medial Expenditures and HbA1c Level



Note: Gilmer et al. (2005) find that medical expenditures for people with a HbA1c level of 7% are lower, on average, than are medical expenditures for people with a HbA1c level of 6%. This difference is not statistically significant, though, and for modeling purposes we assume that health care expenditures are equal for people with HbA1c of 6% and 7%.

C. Impact of Disease Management on HbA1c Level

Costs were estimated by assessing the impact of two hypothetical interventions. One assumes that a population's HbA1c levels can be reduced by 0.48 percentage points, on average. Another assumes that the reduction can reach a 1.09 percentage point decline. Evidence suggests that carefully designed diabetes care quality improvement programs can achieve a 0.48 point reduction, on average, and that certain disease management programs can achieve a 1.09 point reduction, on average, implying improved glycemic control of the population (Shojania et al., 2004).[25]

These assumptions were applied to state employee populations so that estimates of the cost impact of reducing their HbA1c levels by either a 0.48 or 1.09 percentage points represent the difference in health care costs for states' employee populations, given their estimated distribution of HbA1c levels (based on national HbA1c distributions for people with diabetes) and a distribution of HbA1c levels in which everyone has shifted down by either 0.48 or 1.09 percentage points.

[25] Shojania KG, Ranji SR, Shaw LK, Charo LN, Lai JC, Rushakoff RJ, McDonald KM, Owens DK. Diabetes Mellitus Care. Vol. 2 of: Shojania KG, McDonald KM, Wachter RM, Owens DK. Closing The Quality Gap: A Critical Analysis of Quality Improvement Strategies. Technical Review 9 (Contract No. 290-02-0017 to the Stanford University–UCSF Evidence-based Practice Center). AHRQ Publication No. 04-0051-2. Rockville, MD: Agency for Healthcare Research and Quality. September 2004.

IV. Disease Management Costs

The potential savings associated with reducing the HbA1c level of a covered population with diabetes do not include the costs of the intervention that would lead to this outcome. One intervention that could have the impact of reducing a population's HbA1c levels by one percentage point, on average, is disease management. The benefits and costs of implementing a disease management program vary greatly, depending on the intensity of the program and whether it is purchased by a disease management vendor or built into an existing plan. A point estimate of the potential costs to states of purchasing a disease management program from a disease management vendor are provided. This point estimate is based on an estimate of a monthly administrative cost of $35 per participant per month, which is adjusted by state using the medical care component of the CPI. This is based on estimated administrative fees for three diabetes disease management programs.[26,27,28] This estimate is provided only as an example to provide states with an order of magnitude estimate of the cost of providing disease management. Annual cost estimates assume that all employees and dependents in the states' covered populations who are diagnosed with diabetes are enrolled in a disease management program for a full year.

V. Potential Cost Savings

Cost savings were estimated by assessing the impact of the intervention on glycemic control and applying that to the findings of a longitudinal study that estimated per capita savings associated with improvements in glycemic control.[29] The per capita HbA1c reductions associated with disease management interventions were based on the findings of an AHRQ Evidence-based Practice Center evidence report.[30] HbA1c reductions reflected in the calculator represent the median impact of these interventions on HbA1c values across multiple studies cited in the evidence report. In calculating these savings, we make no assumption about the length of time that it will take to achieve a 0.48 or 1.09 percentage point reduction in HbA1c levels. It could take years to achieve these levels of improvement in a covered population's glycemic control. Cost savings reported are one-year cost savings. All savings estimates are reported in 2006 US dollars. Savings are most likely for a state that has not yet instituted a quality improvement or disease management program for its state government employees. Savings are for medical costs only. They exclude gains from lower absenteeism and higher productivity associated with fewer illness episodes related to diabetes.

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26 Berg GD, Wadhwa S. Diabetes Disease Management in a Community-Based Setting *Managed Care* 11(6):45-50, 2002.

27 Sidorov J, Shull R, Tomcavage J, Girolami S, Lawton N, Harris R. Does Diabetes Disease Management Save Money and Improve Outcomes? *Diabetes Care* 25: 684-689, 2002.

28 Report to the Texas Health and Human Services Commission. Fee Reconciliation Process Under the Texas Medicaid Disease Management Program. Contracted Rate with McKesson Health Solutions for Diabetes Disease Management for Medicaid Fee-For-Service Clients for Three-Year Contract Beginning November 1, 2004. Available online: http://www.lewin.com/Lewin_Publications/Medicaid_and_S-CHIP/FeeReconciliationProcess.htm.

29 Gilmer TP, O'Connor PJ, Rush WA, Crain AL, Whitebird RR, Hanson AM, Solberg LI. Predictors of health care costs in adults with diabetes. Diabetes Care 28:59-64, 2005.

30 Shojania KG, Ranji SR, Shaw LK, Charo LN, Lai JC, Rushakoff RJ, McDonald KM, Owens DK. Diabetes Mellitus Care. Vol. 2 of : Shojania KG, McDonald KM, Wachter RM, Owens DK. Closing The Quality Gap: A Critical Analysis of Quality Improvement Strategies. Technical Review 9 (Contract No. 290-02-0017 to the Stanford University–UCSF Evidence-based Practice Center). AHRQ Publication No. 04-0051-2. Rockville, MD: Agency for Healthcare Research and Quality. September 2004.