



Innovation in Health Care: The Economics of Diabetes

Abstracts

Research conducted by The Lewin Group®, commissioned by the National *Changing Diabetes*® Program, a program of Novo Nordisk, Inc.

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Distinguishing the Economic Costs Associated with Type 1 and Type 2 Diabetes¹

Objective: Estimate the economic cost of diagnosed type 1 (T1DM) and type 2 (T2DM) diabetes mellitus in the U.S. in 2007.

Research Design and Methods: We analyze medical claims to estimate the proportion of diagnosed diabetes cases and excess medical costs by diabetes type. We estimate the indirect costs associated with T1DM and T2DM using findings from the literature on diagnosed diabetes, as well as differences in health per case of T1DM and T2DM. This study builds on the Cost of Diabetes Model developed for the American Diabetes Association to estimate the economic burden of diagnosed diabetes.

Results: T1DM accounts for an estimated 5.7% (1.0 million) of the 17.5 million people with diagnosed diabetes. Approximately \$14.9 billion (8.6%) of the economic burden of diagnosed diabetes is associated with T1DM—including medical costs of \$10.5 billion and indirect costs of \$4.4 billion. Costs associated with T2DM are \$159.5 billion—including medical costs of \$105.7 billion and indirect costs of \$53.8 billion.

Conclusions: The economic burden per case of diabetes is greater for T1DM than for T2DM, and the difference increases with age. The prevalence of T2DM is significantly greater than prevalence of T1DM, so T2DM is responsible for most of the economic burden of diabetes. Estimates for T1DM are sensitive to the criteria used to identify people with diabetes using claims data; estimates for T2DM are relatively stable. Improved coding of diabetes type in medical claims and identification of diabetes type in survey data could lead to more precise estimates of the economic burden by diabetes type.

¹ Dall TM, Mann SE, Zhang Y, et al. Distinguishing the Economic Costs Associated with Type 1 and Type 2 Diabetes. *Population Health Management*. In press. Published by Mary Ann Liebert Inc., New Rochelle, New York.

The Economic Cost of Undiagnosed Diabetes ²

Objective: Estimate national economic costs associated with undiagnosed diabetes mellitus (UDM).

Research Design and Methods: UDM is defined as unknowingly having an elevated glucose level that meets the definition of diabetes. We use NHANES data to estimate the prevalence of UDM. Because UDM cannot directly be observed in medical claims for analyzing per capita patterns of health care use, we analyze annual medical claims from a proxy population—people within two years of first diagnosis of diabetes. For a commercially insured population first diagnosed with diabetes in 2006 (n=29,770), we compare their annual health care use in 2004 and 2005 to that of patients with no history of diabetes between 2004 and 2006 (n= 3.2 million). We combine estimates of UDM prevalence from NHANES with health care use patterns from the proxy population to estimate etiological fractions that reflect the portion of national health care use associated with UDM.

Results: Approximately 6.3 million adults in the United States in 2007 have UDM. Annual per capita use of health care services for the UDM proxy population is higher than a comparable group with no history of diabetes, but lower than a comparable group with a history of diabetes. The estimated economic cost of UDM in 2007 is \$18 billion (\$2,864 per person with UDM), including medical costs of \$11 billion and indirect costs of \$7 billion.

Conclusions: Although the high prevalence of UDM makes it an important health issue to be studied, data limitations have contributed to a dearth of information on the health care use patterns and economic costs of UDM. Estimates of the national cost of diagnosed diabetes, by omitting UDM, underestimate the total national cost of diabetes.

² Zhang Y, Dall TM, Mann SE, et al. The Economic Cost of Undiagnosed Diabetes. *Population Health Management*. In press. Published by Mary Ann Liebert Inc., New Rochelle, New York.

Medical Cost Associated with Pre-diabetes ³

Objective: We estimate national health care resource use and medical costs in 2007 associated with pre-diabetes (PD), defined as either fasting plasma glucose between 100 and 125 or oral glucose tolerance test between 140 and 200.

Research Design and Methods: We use Poisson regression with medical claims for an adult population continuously insured between 2004 and 2006 to analyze patterns of health care resource use by PD status. Combining rate ratios that reflect health care use patterns with national PD prevalence rates from NHANES, we calculate etiological fractions to estimate the portion of national health resource use associated with PD.

Results: The findings suggest that PD is associated with statistically higher rates of ambulatory visits for hypertension; endocrine, metabolic, and renal complications; and general medical conditions. PD is associated with a slight increase in visit rates for neurological symptoms, peripheral vascular disease, and cardiovascular disease, but the increase is not statistically significant. There is no indication that PD is associated with an increase in emergency visits and inpatient days. Extrapolating these patterns to the 57 million adults with PD in 2007 suggests that national annual medical costs of PD exceed \$25 billion, or an additional \$443 for each adult with PD.

Conclusions: Pre-diabetes is associated with excessive use of ambulatory services for comorbidities known to relate to diabetes. Our findings strengthen the business case for lifestyle interventions to prevent diabetes by adding additional economic benefits that potentially can be achieved from preventing or delaying pre-diabetes.

³ Zhang Y, Dall TM, Chen Y, et al. Medical Cost Associated with Pre-diabetes. *Population Health Management*. In press. Published by Mary Ann Liebert Inc., New Rochelle, New York.

Cost of Gestational Diabetes Mellitus in the U.S. in 2007 ⁴

Objective: Estimate national medical costs associated with gestational diabetes mellitus (GDM) in 2007.

Research Design and Methods: We analyzed the National Hospital Discharge Survey to estimate national prevalence of GDM. Using Poisson regression analysis with medical claims for about 27,000 newborns and their mothers, we estimated rate ratios that reflect the increase in use of health care services associated with GDM. Combining GDM prevalence rates with these rate ratios, we calculated etiological fractions that reflect the proportion of national health care resource use associated with GDM. We then multiplied these fractions by estimates of national health care use and costs in 2007.

Results: GDM prevalence increases with age, rising from 1.3% of pregnancies of women under age 21 to 8.7% of pregnancies for women over the age of 35. For the estimated 180,000 GDM pregnancies resulting in delivery, average expenditures increased \$3,305 per pregnancy plus \$209 in the newborn's first year of life. GDM increased national medical costs by \$636 million in 2007—\$596 million for maternal costs and \$40 million for neonatal costs. Approximately \$230 million (36%) of GDM related medical costs are carried by government programs (primarily Medicaid), \$355 million (56%) are covered by private insurers, and \$51 million (8%) consists of self pay and charity care.

Conclusions: GDM imposes a significant economic burden. These estimates of the economic burden of GDM likely are conservative because we focus on near-term medical costs, omitting the increased risk for long-term sequelae.

⁴ Chen Y, Quick WW, Yang W, et al. Cost of Gestational Diabetes Mellitus in the United States in 2007. *Population Health Management*. In press. Published by Mary Ann Liebert Inc., New Rochelle, New York.