FROM THE CENTERS FOR DISEASE CONTROL AND PREVENTION

MMWR
Morbidity and Mortality Weekly Report

Incidence of End-Stage Renal Disease Attributed to Diabetes Among Persons With Diagnosed Diabetes—United States and Puerto Rico, 1996-2007

MMWR. 2010;59:1361-1366

2 figures, 1 table omitted

DURING 2007, APPROXIMATELY 110,000 persons in the United States and Puerto Rico began treatment for end-stage renal disease (ESRD) (i.e., kidney failure requiring dialysis or transplantation).[1] Diabetes is the leading cause of ESRD in the United States, accounting for 44% of new cases in 2007.[1] Although the number of persons initiating treatment for kidney failure each year who have diabetes listed as a primary cause (ESRD-D) has increased since 1996,[1,2] ESRD-D incidence among persons with diagnosed diabetes has declined since 1996.[3] To determine whether this decline occurred in every U.S. region and in every state, CDC analyzed 1996-2007 data from the U.S. Renal Data System (USRDS) and the Behavioral Risk Factor Surveillance System (BRFSS). During the period, the age-adjusted rate of ESRD-D among persons with diagnosed diabetes declined 35% overall, from 304.5 to 199.1 per 100,000 persons with diagnosed diabetes, and declined in all U.S. regions and in most states. No state showed a significant increase in the age-adjusted ESRD-D rate. Continued awareness of risk factors for kidney failure and interventions to improve diabetes care are needed to sustain and improve these trends.

USRDS collects, analyzes, and distributes ESRD clinical and claims data to the Centers for Medicare and Medicaid Services (CMS).[1] Health-care providers are required by law to complete the CMS Medical Evidence Report for each new patient with ESRD. USRDS collects demographic data and ESRD-related information (e.g., date patients were first treated, diagnosed primary cause of renal failure). The USRDS Renal Data Extraction and Referencing System, an online data querying application, was used to determine the number of persons initiating ESRD treatment (i.e., dialysis or transplantation) with diabetes listed as a primary cause in each state, the District of Columbia (DC), and Puerto Rico for each of the years during 1996-2007. Throughout the period, the proportion of new ESRD cases that were ESRD-D ranged from 43% to 45%.[1] Incidence of ESRD-D was calculated at a state/territorial and U.S. census region level by dividing the number of persons with a new diagnosis of ESRD-D in the geographic unit (determined by their initiation of treatment) by the estimated number of persons with diagnosed diabetes in the geographic unit. The number of persons aged ≥18 years with diagnosed diabetes was estimated from BRFSS, which conducts state-based, random-digit—dialed telephone surveys in the 50 states, DC, Puerto Rico, and other U.S. territories. In 2007, the median BRFSS response rate was 50.6% (range: 26.9%-65.4%) for the 50 states and DC and 70.4% for Puerto Rico.

Respondents were classified as having diagnosed diabetes if they answered "yes" to the question "Has a doctor ever told you that you have diabetes?" Women who were told that they had diabetes only during pregnancy were classified as not having diabetes. BRFSS data were weighted to represent the noninstitutionalized U.S. population. Data were analyzed using statistical software to estimate standard errors and calculate 95% confidence intervals (CIs). Incidence was age adjusted directly to the 2000 U.S. standard population, and weighted least squares regression was used for state and regional-level trend analyses. Linear and quadratic terms were included in the models, and results were considered significant if $p<0.05$. Nonsignificant quadratic terms were dropped from the models. Significant terms indicated a trend (i.e., linear or nonlinear) in the data over time.

During 1996-2007, the total number of adults aged ≥18 years in the United States and Puerto Rico who began treatment for ESRD-D each year increased significantly, from 32,716 (state range: 32-3,719) to 48,712 (state range: 37-6,059) (test for trend, $p<0.001$). More recently, the number of ESRD-D cases appears to be leveling off. During 2007, approximately 40% of the new ESRD-D cases occurred in the South, and approximately 20% occurred in each of the other three U.S. census regions.* However, the rate of ESRD-D among persons with diagnosed diabetes in 2007 was significantly higher in the West (219.2 per 100,000) compared with the Northeast (182.6 per 100,000). During 1996-2007, the age-adjusted ESRD-D incidence in persons with diagnosed diabetes decreased 35%, from 304.5 per 100,000 (state range: 152.7-544.4) to 199.1 per 100,000 (state range: 108.1-450.0) ($p<0.001$). Incidence declined significantly in all U.S. regions. Estimated age-adjusted ESRD-D incidence declined in most states, but the trend was not significant in every state. The age-adjusted ESRD-D incidence in Puerto Rico increased significantly from 1996 to 2003 ($p<0.001$), and decreased, but not significantly, from 2003 to 2007 ($p=0.30$).

Reported by: NR Burrows, MPH, I Hora, MS, P Cho, MPH, RB Gerzoff, MS, LS Geiss, MA, Div of Diabetes Translation, National Center for Chronic Disease Prevention and Health Promotion, CDC.

CDC Editorial Note: ESRD is a costly and disabling condition that can result in premature death.[1] During 1996-2007, the number of ESRD-D cases increased, as did the number of persons with diagnosed diabetes.[2] However, during this period, the rate of increase

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in the number of persons with diagnosed diabetes was greater than the rate of increase in the number of ESRD-D cases. Thus, among persons with diagnosed diabetes, the age-adjusted ESRD-D rate decreased during the period by 35%, from 304.5 to 199.1 per 100,000 persons with diagnosed diabetes. The age-adjusted ESRD-D incidence also declined in all U.S. regions and in most states. Consistent with this finding, similar declining trends have been seen for other diabetes-related complications, such as lower-extremity amputation and visual impairment.[2] Reasons for this decline in ESRD-D incidence cannot be determined from surveillance data but might include reductions in risk factors for kidney failure (e.g., hyperglycemia and hypertension)[4,5] or better treatment of kidney disease, including the use of new pharmacologic agents (e.g., angiotensin-converting enzyme inhibitors [ACEIs] or angiotensin-receptor blockers [ARBs]) that slow the decline in kidney function and thus delay ESRD-D.[1,6] In 2007, nearly 80% of persons aged 20-64 years with diabetes and chronic kidney disease used ACEIs or ARBs.[1]

Although age-adjusted ESRD-D incidence in the United States has declined, the number of newly diagnosed cases has increased, and that trend likely will continue as the U.S. population ages and as the number of persons with diabetes increases.[2] Furthermore, control of ESRD risk factors remains suboptimal,[7,8] and strategies are needed to sustain declines in ESRD-D incidence to reduce the future ESRD burden. In addition to diabetes and hypertension, risk factors for kidney disease include cardiovascular disease, obesity, elevated cholesterol, increasing age, and a family history of kidney disease.[1] Effective interventions to improve control of blood sugar, hypertension, and lipid levels might slow the progression of kidney disease,[6] and effective community-based approaches to prevent obesity and increase physical activity might reduce the incidence of type 2 diabetes.[9]

The findings in this report are subject to at least three limitations. First, data were collected for patients whose ESRD treatment was reported to CMS and do not include patients who died before receiving treatment or persons who refused treatment and thus were not reported to CMS. Under the ESRD entitlement program, persons initiating treatment for ESRD in the United States and Puerto Rico are entitled to receive Medicare benefits from CMS.[1] Second, changes in incidence of diagnosed ESRD-D might have been caused by factors other than a true change in disease incidence. These factors might include access to or acceptance of ESRD treatment or changes in treatment and care practices. Furthermore, changes in physician reporting of the primary cause of kidney failure could affect incidence, and revised diagnostic criteria for diabetes in 1997 might have led to a greater number of persons being detected with diabetes earlier in the disease process.[10] Finally, the estimated population with diagnosed diabetes is likely to be an underestimate because BRFSS is a telephone survey that excludes the institutionalized population, active duty military personnel, and persons with cellular telephones, and because prevalence is based on self-report.

Continued awareness and interventions to reduce the prevalence of risk factors for kidney failure and to improve diabetes care are needed to sustain the decrease in ESRD-D incidence. CDC and state and territorial diabetes prevention and control programs have been working with public and private partners to reduce the incidence of type 2 diabetes and to improve outcomes for persons with diabetes. CDC's new National Diabetes Prevention Program is supporting the nationwide implementation of community-based lifestyle programs to prevent or delay the onset of type 2 diabetes among persons at high risk.[9] In partnership with YMCA USA, UnitedHealth Group, Indiana University, University of Pittsburgh, and Emory University, CDC is beginning this new program in 17 communities throughout the United States. The National Diabetes Education Program (NDEP), sponsored by CDC and the National Institutes of Health, works with partners at the federal, state, and local levels to improve the treatment and outcomes for persons with diabetes, promote early diagnosis, and prevent or delay the onset of type 2 diabetes. NDEP conducts national, multicultural campaigns to educate persons with diabetes, their families, and health-care providers about the importance of controlling blood glucose, blood pressure, and cholesterol to improve health outcomes and lower the risk for complications (including kidney disease), and to promote behaviors to prevent or delay the onset of type 2 diabetes among persons at risk.† To assess progress in diabetes prevention and control, CDC's National Diabetes Surveillance System monitors the incidence of diabetes and the health and well being of the population with diabetes.[2] In addition, CDC soon will establish a Chronic Kidney Disease Surveillance System to monitor the burden of chronic kidney disease in the United States and evaluate prevention strategies.‡

What is already known on this topic?

The incidence of end-stage renal disease attributed to diabetes (ESRD-D) in the U.S. population with diagnosed diabetes has declined since 1996.

What is added by this report?

The decline in incidence of ESRD-D during 1996-2007 was confirmed in all U.S. regions and most states.

What are the implications for public health practice?

Continued awareness and interventions to reduce the prevalence of risk factors for kidney failure and to improve diabetes care are needed to sustain the widespread decrease in ESRD-D incidence.

Acknowledgments

This report is based, in part, on contributions from BRFSS state coordinators and the Div of Behavioral Surveillance, Office of Surveillance, Epidemiology, and Laboratory Svcs, CDC.

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**Midwest*: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin; *Northeast*: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont; *South*: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia; *West*: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.
†Additional information is available at http://ndep.nih.gov/about-ndep/index.aspx.
‡Additional information is available at http://www.cdc.gov/diabetes/projects/kidney.htm.

Progress Toward Control of Rubella and Prevention of Congenital Rubella Syndrome—Worldwide, 2009

MMWR. 2010;59:1307-1310

1 figure, 1 table omitted

RUBELLA USUALLY IS A MILD, FEBRILE RASH illness in children and adults; however, infection early in a woman's pregnancy, particularly during the first 16 weeks, can result in miscarriage, fetal death, or an infant born with birth defects (i.e., congenital rubella syndrome [CRS]).[1] In 2000, the World Health Organization (WHO) published the first rubella vaccine position paper to guide introduction of rubella-containing vaccine (RCV) in national childhood immunization schedules.[2] As of December 2009, a total of 130 WHO member states have introduced RCV, a 57% increase from 83 member states in 1996. In addition, goals to eliminate rubella and CRS have been established in the WHO Region of the Americas (by 2010) and the WHO European Region (by 2015),* and the WHO Western Pacific Region has established targets for accelerated rubella control and CRS prevention by 2015. During 2009, a total of 121,344 rubella cases were reported from 167 member states to WHO, an 82% decrease from 670,894 cases reported in 2000 from 102 member states. This report summarizes reported rubella and CRS cases globally and progress toward global introduction and use of RCV.

Member states submit information to WHO on the number of reported cases of rubella and CRS, and the use, timing, and number of RCV doses administered in the national immunization schedule using the WHO/UNICEF Joint Reporting Form (JRF). JRF data were analyzed for 1996 and 2009 to assess changes in rubella vaccine use, and from 2000 to 2009 to measure changes in reported burden of rubella and CRS.† Case definitions for rubella and CRS‡ have been published by WHO; however, the exact definition used might differ slightly to reflect specific regional conditions.[3] WHO recommends that member states have first-dose measles-containing vaccine (MCV1) coverage of >80% before introducing RCV.[2] To assess member state eligibility for RCV introduction, WHO/UNICEF MCV1 coverage estimates for 2009 were reviewed. To assess overall MCV1 coverage for 2009, median and interquartile ranges of MCV1 coverage estimates were calculated separately for member states using RCV and for member states not using RCV.

Use of rubella-containing vaccine

As of December 2009, a total of 130 of the 193 WHO member states used RCV in national immunization schedules, including two (4%) of 46 member states in the WHO African Region (AFR), 35 (100%) in the Region of Americas (AMR), 15 (71%) of 21 in the Eastern Mediterranean Region (EMR), 53 (100%) in the European Region (EUR), four (36%) of 11 in the South-East Asia Region (SEAR), and 21 (78%) of 27 in the Western Pacific Region (WPR). In comparison, only 83 member states used RCV in their national immunization schedules in 1996.

Among the 130 member states with RCV in their national immunization schedules as of December 2009, the first dose is recommended to be administered at ages 12-24 months in 122 (94%) member states. Although only one RCV dose is recommended routinely, 119 (92%) member states use a 2-dose schedule because rubella vaccine is combined with measles vaccine, which requires a 2-dose schedule. Measles-mumps-rubella (MMR) vaccine is used in 115 (88%) member states, measles-rubella (MR) vaccine is used in 12 (9%) member states, measles-mumps-rubella-varicella vaccine is used in two (2%) member states, and single-antigen rubella vaccine is used in one member state.

In 2009, median MCV1 coverage was 96% (interquartile range: 92%-99%) for the 130 member states using RCV, including nine member states (Azerbaijan, the Cook Islands, the Dominican Republic, Ecuador, Haiti, Iraq, Lebanon, Palau, and Samoa) with MCV1 coverage ≤80%. For member states not using RCV, the median MCV1 coverage was 76% (interquartile range: 74%-91%), including 22 member states§ with sustained MCV1 coverage >80% in 2009 that have met the vaccination coverage criteria for introduction of RCV.

Reported Rubella and CRS Cases

During 2009, a total of 121,344 rubella cases from 167 member states were reported to WHO, an 82% decrease from 670,894 cases reported during 2000 from 102 member states. The greatest percentage decrease between 2000 and 2009 was in AMR, where reported rubella cases decreased nearly

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