

Running the Numbers

*A Periodic Feature to Inform North Carolina Health Care Professionals
About Current Topics in Health Statistics*

*From the State Center for Health Statistics, North Carolina Department of Health and Human Services
<http://www.schs.state.nc.us/SCHS>*

Selected Data on Chronic Kidney Disease in North Carolina

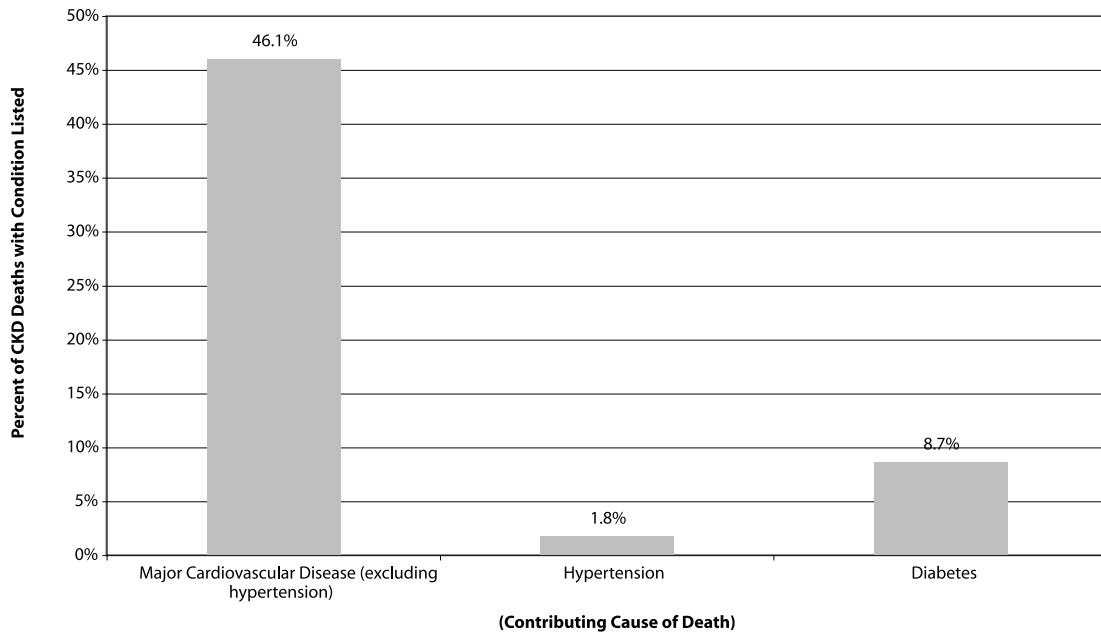
Chronic kidney disease (CKD) is the 10th leading cause of death among North Carolina residents, based on the primary or underlying cause of death. In 2006, there were 1631 deaths with CKD attributed as the primary cause, representing 2% of all 74 419 deaths of North Carolina residents in 2006. This is based on the International Classification of Diseases, Tenth Revision (ICD-10) cause-of-death codes N00-N07, N17-N19, and N25-N27 (nephritis, nephrotic syndrome, and nephrosis).

Another article in this issue by Suma Vupputuri addresses the epidemiology and costs of CKD. Among her findings are that the age-adjusted CKD death rate for minorities is more than twice as high as the rate for Whites. The incidence rate of end-stage kidney disease (ESKD) for African American men is 3.3 times as high as the rate for White men, and the ESKD incidence rate for African American women is 4.3 times as high as the rate for White women. Other data show that the age-adjusted CKD death rate for males is about 25% higher than the CKD death rate for females and that the CKD death rate is many times as high in the oldest age groups compared to younger age groups.

In addition to the 1631 deaths in 2006 where CKD was assigned as the primary cause, there were an additional 5706 deaths where another primary cause of death was assigned, but CKD was listed as a contributing cause of death. Adding these 2 numbers results in an estimate of nearly 10% of all North Carolina deaths having CKD as the primary or a contributing cause. This does not indicate the total morbidity of CKD at the time of death but only those deaths where CKD was determined by the certifying physician on the death certificate to have contributed directly or indirectly to the death. Because of the many comorbidities and complications associated with CKD, the 10% figure may substantially underestimate the total contribution of CKD to deaths in North Carolina.

Diabetes, hypertension, and cardiovascular disease are frequent comorbidities with CKD. These are risk factors that can contribute to the development of CKD, and CKD can lead to cardiovascular disease or hypertension. Figures 1 and 2 show the relationships between CKD and these conditions based on data from the 2006 death certificates. In general, these data indicate substantial interrelationships between CKD and cardiovascular disease, hypertension, and diabetes. Note that in Figure 1 the contributing diagnoses are not mutually exclusive; a decedent could have had one or more of these conditions listed on the death certificate with CKD as the primary cause. The low percentage for hypertension as a contributing factor for deaths with CKD as the primary cause (Figure 1) does not necessarily indicate a low prevalence of hypertension in this group; perhaps hypertension led to a major cardiovascular disease that contributed more directly to the CKD death and was therefore recorded on the death certificate. The results in Figures 1 and 2 are a function of the death certificate certifying practices of physicians in North Carolina.

Figure 1.
2006 North Carolina Resident Deaths with Chronic Kidney Disease as the Primary Cause: Percentage with Selected Conditions Indicated as a Contributing Cause of Death



Until recently, there have been no direct estimates for the total prevalence of CKD in North Carolina. Since Medicare pays for services for all patients with ESKD, there are complete data on ESKD prevalence in the state. (See Vupputuri article.) But less than one-fourth of 1% of North Carolinians have ESKD. Data from the 1999-2000 National Health and Nutrition Examination Survey (NHANES) show that approximately 12% of the US population had CKD in any stage, based on direct creatinine measurements.¹ The 1999-2000 NHANES also asked the survey subjects if they had ever been told by a doctor or other health professional that they had weak or failing kidneys. Only 2% responded "yes" to this question, indicating low awareness of kidney disease; even those with substantially decreased kidney function had relatively low awareness.¹

Beginning in 2007, the North Carolina BRFSS (Behavioral Risk Factor Surveillance System) random telephone survey of adults (ages 18+) included the question, *Have you ever been told by a doctor, nurse, or other health professional that you have some form of kidney disease including chronic kidney disease, nephritis, nephrosis, renal disease, or end-stage renal disease?* There were 6842 BRFSS respondents who answered this question in 2007. The results are based on self-report over the telephone by the BRFSS respondents. The information in Table 1 provides a first look at these new BRFSS data on the awareness of CKD among North Carolina adults.

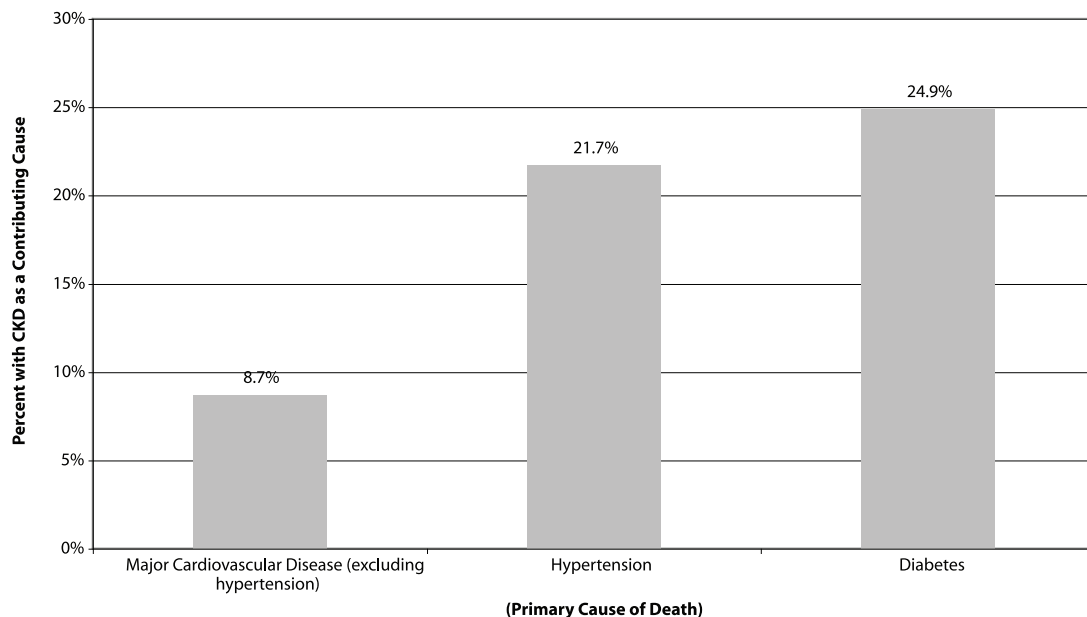
These data show that 2.6% of North Carolina adults reported in 2007 that they had been told by a health professional that they had some form of kidney disease, much lower than the NHANES results based on physical measurement (12%), but higher than the self-reported data from NHANES (2%). The NHANES measurements

Table 1.
Percentage of North Carolina Adults with Kidney Disease (and 95% Confidence Interval, CI) by Selected Respondent Characteristics: 2007 Self-Reported BRFSS Data

	% (CI)		% (CI)
Total	2.6 (2.1-3.1)	Age 18-24	0.1 (0.0-0.6)
		Age 25-34	0.9 (0.4-1.8)
Male	2.8 (2.1-3.7)	Age 35-44	1.9 (1.1-3.3)
Female	2.3 (1.9-2.9)	Age 45-54	3.1 (2.0-4.8)
		Age 55-64	3.5 (2.3-5.2)
White	2.7 (2.2-3.3)	Age 65-74	4.5 (3.1-6.3)
African American	2.3 (1.5-3.7)	Age 75+	6.6 (4.6-9.4)
Disability	5.4 (4.3-6.7)	< \$15,000 Income	5.5 (3.5-8.4)
No Disability	1.4 (1.0-1.9)	\$15,000-\$24,999	3.0 (2.0-4.3)
		\$25,000-\$34,999	2.5 (1.4-4.5)
Diabetes	8.9 (6.5-12.0)	\$35,000-\$49,999	2.3 (1.4-3.7)
No Diabetes	1.9 (1.5-2.4)	\$50,000-\$74,999	3.1 (1.9-5.2)
		\$75,000+ Income	1.4 (0.8-2.5)
Hypertension	5.6 (4.4-6.9)		
No Hypertension	1.2 (0.8-1.6)		

of creatinine may pick up many early-stage kidney disease cases that have not been diagnosed by a health professional. The accuracy of self-reporting over the telephone is also an issue. Nevertheless, the data in Table 1 suggest that the percentage with diagnosed kidney disease is higher for males than females, higher for people with a disability, higher for those with diabetes or hypertension, higher for older people, and higher for people with lower household incomes. African Americans have a slightly lower percentage of self-reported kidney disease than Whites, which may in part indicate differences in access to health care and therefore the opportunity for a diagnosis. However, the 1999-2000 NHANES data based on physical measurement indicated that Whites and African Americans have approximately the same overall prevalence of CKD, despite much higher ESKD rates and CKD death rates among African Americans.¹ Based on non-overlapping confidence intervals, the statistically significant differences in kidney disease in Table 1 are disability versus no disability, diabetes versus no diabetes, hypertension versus no hypertension, the oldest age groups versus the youngest, and the lowest income group versus the highest.

Figure 2.
2006 North Carolina Resident Deaths with Cardiovascular Disease, Hypertension, and Diabetes as the Primary Cause: Percentage with Chronic Kidney Disease Indicated as a Contributing Cause of Death



The data in this report show that CKD is responsible for, or contributes to, at least 10% of all deaths in North Carolina. In addition, CKD is an important cause of morbidity in North Carolina's population. In 2005 in North Carolina, there were more than 10 000 inpatient hospital discharges with CKD listed as the principal diagnosis, with associated hospital charges of more than \$190 million. There were another 55 400 inpatient hospital discharges in 2005 with CKD listed as a contributing diagnosis with associated hospital charges of more than \$1.8 billion. Clearly, efforts are needed to reduce the burden of CKD in North Carolina in terms of mortality, morbidity, and medical care costs.

REFERENCES

- 1 Coresh J, Byrd-Holt D, Astor BC, et al. Chronic kidney disease awareness, prevalence, and trends among US adults, 1999 to 2000. *J Am Soc Nephrol.* 2005;16(1):180-188.

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