Quick Facts

Chronic kidney disease is a significant and growing health problem in the United States.¹

Most kidney disease is associated with either diabetes or hypertension (high blood pressure) or both, although obesity and cardiovascular disease also contribute to the risk.²

Most of what we know about environmental exposures and chronic kidney disease comes from occupational settings.³,⁴

CDC estimates that more than 10% of adults in the United States are living with chronic kidney disease.² In 2011, the cost of care for Medicare patients with chronic kidney disease totaled $45.5 billion, 18% of the Medicare budget, up from 3.8% of the Medicare budget in 1993.⁵

Kidney disease is the ninth leading cause of death in the United States and was responsible for the deaths of approximately 92,000 people in 2011.⁶ Most of these deaths resulted from chronic (rather than acute) kidney disease.

What Is Chronic Kidney Disease?

Chronic kidney disease (CKD) is a gradual decrease in kidney function that usually produces no symptoms until the disease is advanced. CKD affects over 10% of adults in the United States.⁵ People with CKD are more likely to die from cardiovascular disease than develop kidney failure.⁷

The kidneys remove wastes and excess water from the blood. A patient is diagnosed with CKD if, over a period of at least three months, the kidneys’ ability to purify blood deteriorates, usually from disease or injury. After CKD has been diagnosed, lifestyle changes and medication can slow the disease’s progression.² In the most advanced stage of CKD, patients must receive dialysis (filtering blood through a machine) or a new kidney through transplantation to survive. At this point, the patient is considered as having end-stage renal disease (ESRD).
WHAT ARE THE RISK FACTORS FOR CHRONIC KIDNEY DISEASE?

NON-ENVIRONMENTAL RISK FACTORS
Diabetes or high blood pressure or both are the most important risk factors for developing CKD and are responsible for up to two thirds of all cases. Obesity and cardiovascular disease also contribute to the risk of developing CKD and its progression. Other identified risk factors include a family history of kidney disease, age, smoking, repeated or untreated urinary tract infections, gum disease (periodontitis), kidney defects present at birth, and diseases that affect the body’s immune system. However, about 5% of patients with ESRD have no known risk factors.1,2,3,4

ENVIRONMENTAL RISK FACTORS
The contribution of environmental and occupational toxins to kidney disease remains largely unknown. Reports of impaired kidney function following occupational exposure to some substances—especially heavy metals—suggest that chronic, low-level environmental exposures may contribute to CKD. A growing body of evidence supports such links.3

Lead. Numerous studies have documented a connection between lead and CKD or other forms of kidney disease. While the minimum blood lead concentration that adversely affects the kidneys remains unknown, impaired kidney function has been observed at blood lead levels below 20 micrograms per deciliter and, possibly, below 10 micrograms per deciliter.4,5 The CDC currently considers a blood lead level of 5 micrograms per deciliter or greater to be elevated and to require individualized case management.6

Cadmium. Many studies have correlated kidney damage with occupational exposure to cadmium fumes and cadmium oxide dust.7 Additional studies suggest a link between environmental exposure to cadmium and kidney dysfunction and failure.8,9,10

Mercury. Adverse kidney health effects are associated with both occupational and environmental exposure to mercury.11,12

Silicon. Occupational exposure to silicon-containing compounds has been linked to an elevated risk for CKD and ESRD.13,14,15
Organic Solvents. Exposure to organic solvents may be a risk factor for kidney disease, but more research on individual solvents or classes of solvents is needed to assess the risk of kidney damage.4,25,26,27,28,29,30,31,32,33

HOW ARE WE TRACKING CHRONIC KIDNEY DISEASE?
National surveillance data on chronic kidney disease are limited, particularly with respect to incidence rates of CKD prior to the onset of ESRD. ESRD has been much more thoroughly tracked than CKD; therefore, most of the available statistics pertain to ESRD. However, patients with ESRD account for only a small fraction of patients with CKD. For example, CDC estimates that more than 20 million people may have CKD while 113,000 people started treatment for ESRD in 2011.2 The U.S. Renal Data System estimates of the prevalence of ESRD in December 2011 were 615,899 people.34

To derive an estimate of national CKD prevalence, results of kidney function tests are gathered from a sample of U.S. residents. These tests identify people who have CKD or are at high risk for developing CKD. Hospital discharge records provide another measure of the CKD burden,35 and death certificates are used to estimate the number of deaths attributable to CKD.36 In addition, the U.S. Renal Data System uses claims data from Medicare and employer group health plans to access CKD incidence in the general population.37

Although these data are useful, they do not reveal whether diseases like diabetes and hypertension precede and possibly cause CKD or vice versa, nor do they shed much light on the role of environmental pollutants in CKD development. To address these and other data needs, the Centers for Disease Control and Prevention (CDC), in collaboration with the University of Michigan and the University of California at San Francisco, is developing a comprehensive national surveillance system that will monitor trends in prevalence, risk factors, and care practices that impact on CKD prevention and control, and for monitoring kidney disease objectives for Healthy People 2020.2,38 The National CKD Surveillance System, available through an interactive Web site (www.cdc.gov/ckd,) is crucial for documenting the burden of CKD and its risk factors in the U.S. population over time, and for tracking the progress of efforts to prevent, detect, and manage CKD and its complications.38

STATUS AND TRENDS
Calculations using death certificates, laboratory testing, and information gathered by the United States Renal Data System (USRDS) and the CDC indicate that kidney disease is a significant and growing health problem in the United States. Kidney disease is the ninth leading cause of death and accounted for about 92,000 deaths in persons of all ages in 2011.6 The percentage of the U.S. population with CKD has been increasing. The estimated prevalence of pre-ESRD CKD during 1999 to 2010 was 15.8% of adult NHANES participants aged 20 years.
or older (approximately 1 in 6 adults), compared
with 14.2% (approximately 1 in 7 adults) cal-
culated for 1988 to 1994. This represents an increase
of 11.3%, based on crude estimates of prevalence.
Some of the increase in pre-ESRD CKD between
1994 and 2010 could be attributed to the general
aging of the population in those 16 years. These
estimates have not been adjusted for age which
is a major consideration in the onset of CKD.38

The rate of new ESRD cases increased or remained
stable each year from 1996 to 2007. After a 2.1%
decrease in the adjusted incidence rate of ESRD
in 2007, the rate fell 0.9% in 2008, rose by 1.1%
in 2009 and then decreased in both 2010 and 2011
by 1.9% and 3.8%.34,39

Prevalence rates for ESRD increased between
1.9% and 2.3% each year between 2003 and 2008.37
Adjusted prevalence rates for ESRD rose in 2011
by 1.3%. This was lower than the increase in 2010,
which was 1.8 percent. The rate of increase
between 2004 and 2010 ranged between 1.7 and
2.2 percent. The prevalence rate for 2011 therefore
shows a slower rate of increase compared
to previous years.34

In 2011, the adjusted incident rate of ESRD
averaged 449 per million population in the upper
quintile and was highest in areas of the Ohio
Valley, and in portions of Texas and California
(Figure 1). Rates were adjusted for age, race,
gender and ethnicity.34

Both pre-ESRD CKD and ESRD disproportionately
affect racial and ethnic minorities and the elderly
(Figure 2, Figure 4). In 2011, ESRD incidence rates
for Non-Hispanic blacks/African Americans and
Native Americans were 3.4 and 1.6 times greater
than the ESRD incidence rates for whites. After
rising in the middle of the decade, rates for both
whites and Asians are now near the levels seen
in 2000, while rates for blacks/African Americans
and Native Americans are now 10.2 and 36 percent
lower.34

Patient ethnicity became a required field on the
1995 revised medical report form. Because data
for 1995 are incomplete, information on Hispanic
patients is presented starting in 1996. The non-
Hispanic category includes all non-Hispanics and
patients with unknown ethnicity.39

Fourteen percent of new ESRD patients in 2011
were Hispanic, up from 12.6 percent in 2007. While
the rate of ESRD among Hispanics fell 3.0 percent
between 2010 and 2011, to 518, it remains 1.5 times
greater than that seen in the non-Hispanic
population. (Figure 3)34

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*Figure 1. Geographic variations in adjusted incidence rates of ESRD per million population, 2011.*
Figure 2. Trends in ESRD incidence rates from 1980 to 2011, by Race\textsuperscript{34}.

From 2000 to 2011, the adjusted incidence rate of ESRD grew 7.1 percent for patients age 75 and older, to 1,707 per million population (Figure 4).\textsuperscript{34} Rates for those age 0–19 and 20–44 increased 10.1 and 4.1 percent, respectively, to 15.6 and 127 per million population. Rates for patients age 45–64 and 65–74, in contrast, though rising slightly during the decade, are now 8.1–8.3 percent lower than in 2000, at 571 and 1,307 per million population, respectively.\textsuperscript{34}

The number of ESRD patients on dialysis in the United States has grown from 49,885 in 1980 to 430,273 in 2011.\textsuperscript{34}

Figure 3. Incident counts & adjusted rates of ESRD, by Hispanic ethnicity\textsuperscript{34}.

Figure 4. Incident counts & adjusted rates of ESRD, by age\textsuperscript{34}.
**PREVENTION**

Treatment and control of high-risk health conditions, particularly diabetes, hypertension, cardiovascular disease, and obesity, are most important in the prevention of kidney disease. Early detection of kidney disease can prevent or delay CKD.

**WHAT CAN YOU DO TO PREVENT CHRONIC KIDNEY DISEASE?**

- If you are at risk for diabetes, hypertension, or cardiovascular disease, seek the care of a health care provider to reduce your risk for these diseases and, therefore, the risk for developing kidney disease.

- If you have diabetes, hypertension, cardiovascular disease, or some combination of these illnesses, seek the care of a health care provider for treatment to reduce your risk of kidney disease.

- Take medication as prescribed by your health care provider.

- Maintain a blood pressure within the range recommended by your health care provider. Keep your blood sugar as close to normal as possible, and maintain a healthy weight.

- Do not smoke or use other tobacco products.

- Reduce your exposure to heavy metals. Avoid peeling paint or paint dust from housing built before 1978 because it might contain lead.

- Reduce your exposure to mercury by limiting your consumption of fish high in mercury, such as shark, swordfish, king mackerel, and tilefish. Pregnant women, women who might become pregnant, nursing mothers, and young children should not eat these fish at all and should limit their consumption of fish that are low in mercury, such as shrimp, canned light tuna, salmon, pollock, and catfish, to two meals a week.

**ADDITIONAL RESOURCES**

- The National Kidney Disease Education Program (NKDEP) of the National Institutes of Health at www.nkdep.nih.gov/index.htm.

- The United States Renal Data System (USRDS) at www.usrds.org/.


- Centers For Disease Control and Prevention National Chronic Kidney Disease Fact Sheet www.cdc.gov/diabetes/pubs/factsheets/kidney.htm

- National Kidney Foundation at www.kidney.org/
REFERENCES


