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Chronic Kidney Disease

Lead Agency: National Institutes of Health

Contents

Goal

Reduce new cases of chronic kidney disease and its complications, disability, death, and economic costs.

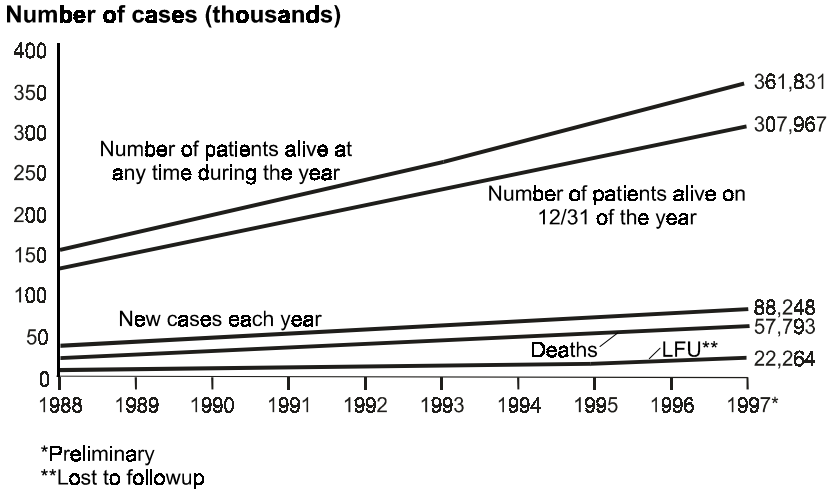
Overview

Issues and Trends

Chronic kidney failure is the most significant result of chronic kidney disease. When kidney function has deteriorated and is no longer adequate to sustain life and the process is considered irreversible, renal replacement therapy (RRT)—dialysis or transplantation—becomes necessary to maintain life. Treated chronic kidney failure, also called end-stage renal disease (ESRD), is the most feared consequence of kidney disease. Chronic renal insufficiency, however, is more common than treated chronic kidney failure and can also severely affect health and well-being. Therefore, ideally, programs should be directed at preventing the development of chronic renal insufficiency and its subsequent progression to ESRD.

Unfortunately, chronic renal insufficiency is usually asymptomatic, and the exact number of people affected is unknown. The best available estimates are based on national surveys. Current estimates indicate approximately 10 million persons aged 12 years and older have some form of chronic kidney disease.[1] People with end-stage kidney failure represent a small fraction of all individuals with chronic kidney disease. A significant proportion of people with chronic kidney failure

End-Stage Renal Disease: Reported Trends
(By year, United States, 1988–97)



Source: NIH. U.S. Renal Data System, *1999 Annual Data Report*.

progress to end stage. The challenge is to initiate effective programs to prevent progression of established kidney disease and to institute methods to assess the progress of such initiatives.

In 1997, 80,248 new cases of end-stage kidney failure were reported.[2] Virtually all of these patients became permanently dependent on renal replacement therapy to stay alive.

Dialysis and kidney transplantation are the two methods of treatment available to people with kidney disease when they reach end stage. In 1997, 361,031 people in the United States depended on either dialysis or transplants to replace the function of their own failed kidneys.[3] Although these treatments are lifesaving, dialysis and transplants have substantial limitations. Neither treatment restores normal health, and both are expensive.[4] The rates of illness, disability, and death experienced by individuals with treated chronic kidney failure are substantially higher than those of the general population.[5]

In most instances, terminal kidney failure develops as the result of progressive damage to the kidneys over a decade or more. A number of underlying diseases can cause progressive kidney failure. The two most important of these are diabetes, which in 1997 accounted for 42 percent of the new cases of chronic kidney failure, and high blood pressure, which was responsible for 26 percent of the new cases.[6] Other conditions that contribute significantly include glomerulonephritis, vasculitis, interstitial nephritis, and genetic and congenital disorders, particularly polycystic kidney disease.[7]

Chronic kidney failure affects people of all ages. The number of new cases peaks in the sixth decade of life, but 25 percent of persons arriving at end stage in 1997 were under age 45 years, and 1.5 percent—nearly 1,100—were under age 20 years.[6] Kidney failure is particularly devastating in childhood, often resulting in impaired growth and development.

A worrisome increase in the number of new cases of kidney failure occurred between 1987 and 1997. The rate increased from 142 per million population in 1987 to 296 per million population in 1997,[8] representing an increase in the annual number of new cases from 34,797 to 80,248,[9] respectively.

This relentless growth in new cases of kidney failure has occurred in spite of the fact that death rates from other diseases, especially cardiovascular diseases, have declined.[10] The increase has not been confined to a single age group. Although the rates of new cases have grown slightly more rapidly for individuals aged 75 years and older, sizable increases have been noted in every age group.[11]

The causes of these increases are not completely understood, but one major factor appears to be an increase in the number of new cases of diabetes, particularly type 2 diabetes.[12, 13] In 1987, the rate of new cases of treated chronic kidney failure due

to diabetes was 45 per million population. By 1997, the rate had increased to 124 per million population.[14]

Treatment for end-stage kidney failure has a substantial impact on Federal resources for health care. The 1972 Social Security Amendment (Public Law 92-603) instituted federally financed health care coverage for dialysis and renal transplantation, effective July 1, 1973. The cost of this program has far exceeded original expectations. Medicare spending in 1996 was estimated to be $10.96 billion, a 12.5 percent increase from the $9.74 billion spent in 1995. The total expenditure by all payers for treating these patients in 1996 was estimated at $14.55 billion, up from $13.05 billion in 1995.[15] Although this patient population made up only 0.6 percent of the total Medicare population in 1994, it consumed 5.1 percent of Medicare expenditures.[16] The increases in the cost per patient have been modest, but the driving force behind the growth in these expenditures has been the growing number of patients.

Kidney disease develops and progresses more rapidly to end stage in people with chronic health problems (such as type 1 or type 2 diabetes or high blood pressure) or with a family history of genetic kidney diseases. Therefore, people with these chronic health problems require counseling about the possibility of kidney disease and the steps they must take to avoid serious kidney complications. Also, people who have proteinuria and/or elevated serum creatinine have a greater likelihood of developing serious cardiovascular disease (CVD) complications. Therefore, cardiovascular risk assessment and management should include kidney function to prevent the consequences of kidney failure. Because national data systems will not be available in the first half of the decade to track progress, these issues are not addressed in the chapter.

Disparities

Kidney disease has a disproportionate impact on certain racial and ethnic groups, especially African Americans and American Indians or Alaska Natives. African Americans have the highest overall risk of chronic kidney disease. The reasons are not entirely explained by the higher number of persons in this population who have diabetes and high blood pressure.[17, 18] On average, African Americans develop end-stage kidney failure at an earlier age than whites (55.8 years compared to 62.2 years).[19] American Indians or Alaska Natives have a much higher risk of chronic kidney disease due to diabetes than whites. Overall, the rates of new cases are 4 times higher in African Americans and American Indians or Alaska Natives and 1.5 times higher in Asians or Pacific Islanders than in whites.

Annual increases in ESRD rates are greater in certain racial and ethnic populations than in white populations. Rates of new cases are increasing by 7 percent per year for African Americans, 10 percent per year for American Indians or Alaska Natives, and 11 percent for Asians or Pacific Islanders, compared to 6 percent per year for whites. Two communities of an American Indian Tribe, the Zuni Pueblo in New Mexico and in Sacaton, Arizona, may have the highest rates of chronic

kidney failure in the world, at 12.6 and 14.0 times the overall average U.S. rate, respectively. Projections indicate that increases in the rates of new cases will continue in American Indians or Alaska Natives.

Although complete data are not yet available, some evidence indicates that persons of Mexican ancestry also may have a high risk of developing chronic kidney failure, particularly due to diabetes.[20, 21] In 1995, the Health Care Financing Administration changed the way in which data on race and ethnicity are collected on the Medical Evidence Form used to enroll patients into the Medicare End-Stage Renal Disease Program. Data from 1997 suggest that 7 percent of the ESRD patients are of Mexican ancestry and another 4 percent are of Hispanic ancestry from areas other than Mexico.[22]

The disproportionately high rates of chronic kidney failure among certain racial and ethnic groups have resulted in a greater burden of disease in these communities. In 1996, African Americans constituted 12.6 percent of the U.S. population but 29.8 percent of ESRD patients; American Indians or Alaska Natives constituted 0.9 percent of the U.S. population but 1.7 percent of those receiving renal replacement therapy.[23] On December 31, 1996, the point-prevalent rate per million population (adjusted for age and gender) was 3,404 in African Americans and 2,761 in American Indians or Alaska Natives, compared to 754 in whites, differences of 4.5- and 3.7-fold, respectively.[24] Data on persons of Asian or Pacific Islander ancestry indicate slightly higher incidence and prevalence rates than those for whites.[25]

There is a slight preponderance of kidney failure in men. In 1997, the incidence of treated chronic kidney failure was 322 per million population in men, compared with 271 per million in women.[8]

Renal transplantation is an important lifesaving renal replacement therapy and has been shown to offer many advantages when compared with dialysis.[26, 27] In 1997, 12,445 transplants were performed in the United States. There was significant gender discrepancy, with 7,352 transplants for men, compared with 4,948 for women.[28] Racial and ethnic disparities also exist. Between 1994 and 1997, the first cadaveric transplantation rates (per 100 patient years) in the pediatric age group were 31 for black males, 28 for white males, 19 for black females, and 26 for white females. For recipients between the ages of 20 and 44 years, the rates were 7 for black males, 17 for white males, 7 for black females, and 15 for white females. In the 45- to 65-year age group, the rates were 4 for black males, 8 for white males, 2 for black females, and 6 for white females.[29] The data from the U.S. Renal Data System (USRDS) database also confirm that the transplantation rate is lower for Native Americans. The transplantation rate in Asians is equivalent to the rate in whites.[30] Reasons for the racial and ethnic disparities in the rate of transplantation are varied and include differences in finding human leukocyte antigen matches, cultural attitudes and beliefs on the part of both patients and health care providers, socioeconomic status, rates of organ donation, and geographic location.

Opportunities

Major risk factors for the development and progression of chronic kidney disease include diabetes, high blood pressure, environmental exposures, proteinuria, family history of kidney disease, and increasing age. African Americans and American Indians or Alaska Natives who have these risk factors are especially susceptible to the development of chronic and progressive kidney disease.[31, 32] Strategies for preventing the development of chronic kidney disease, therefore, should use appropriate methods to target these populations.

Under certain circumstances, the progression of kidney disease to end stage can be slowed or halted. Three interventions are effective in certain defined populations: glycemic control (for patients with diabetes), blood pressure control (for patients with high blood pressure), and use of angiotensin-converting enzyme (ACE) inhibitors. Interventions to slow the progression of kidney disease and prevent chronic kidney failure are likely to have the greatest impact if applied early in the course of the disease. Unfortunately, because kidney disease in its early stages is generally asymptomatic, many people who would benefit from these interventions are not identified. Early identification of patients at risk for chronic kidney disease is essential in reducing the growth in the number of new cases of treated chronic kidney failure. For example, microalbuminuria screening and more intensive treatment of patients with microalbuminuria are an important part of a strategy to reduce nephropathy in persons with type 1 diabetes, both in terms of economic indices and clinical outcomes.[33, 34, 35] This strategy also may be useful in type 2 diabetes.

Patient care must continue to emphasize interventions to conserve residual renal function. At a certain stage, however, providing appropriate preparation for renal replacement therapy becomes advisable. Several studies show that many patients with chronic kidney failure do not receive optimum preparation for treated chronic kidney failure in the year prior to the commencement of RRT. This lack of optimal preparation has a substantial effect on the cost of care and on illness and disability at the time of RRT.[36]

Kidney transplantation has emerged as the preferred therapy for many patients with treated chronic kidney failure, particularly children. Kidney transplantation confers a survival advantage over dialysis.[37] Over the past decade, transplantation success rates, especially 1-year patient and graft survival, have improved steadily. This improvement has been observed in both cadaveric and living-related transplants.[38, 39] For young children, kidney transplantation results in improved rates of growth.[40] Because of accumulating evidence on the advantages of transplantation, equal access of all population groups to transplantation is a substantial concern. Certain racial and ethnic groups and women consistently have longer waiting times and lower rates of kidney transplantation than white males.[41, 42, 43, 44, 45, 46]

Attention to risk factors for kidney disease and interventions to slow its progression are urgently needed. This need is driven by the increasing number of cases of treated chronic kidney failure, its disproportionate effect on certain racial and eth-

nic groups, the high societal cost of the disease, and the impact on Federal health care resources.

Interim Progress Toward Year 2000 Objectives

Healthy People 2000 did not include a chapter on chronic kidney disease. However, objectives relating to chronic kidney disease were included in several chapters. Since the mid-1980s, the number of new cases of ESRD has grown steadily. One objective concerning diabetes addressed ESRD. Results show that ESRD among people with diabetes has more than doubled since 1987 and is moving away from the target. Subobjectives tracking ESRD due to diabetes among African Americans and American Indians or Alaska Natives also are moving away from their targets.

Note: Unless otherwise noted, data are from the Centers for Disease Control and Prevention, National Center for Health Statistics, *Healthy People 2000 Review, 1998–99.*

Chronic Kidney Disease

Goal: Reduce new cases of chronic kidney disease and its complications, disability, death, and economic costs.

Number	Objective Short Title
4-1	End-stage renal disease
4-2	Cardiovascular disease deaths in persons with chronic kidney failure
4-3	Counseling for chronic kidney failure care
4-4	Use of arteriovenous fistulas
4-5	Registration for kidney transplantation
4-6	Waiting time for kidney transplantation
4-7	Kidney failure due to diabetes
4-8	Medical therapy for persons with diabetes and proteinuria

4-1. Reduce the rate of new cases of end-stage renal disease (ESRD).

Target: 217 new cases per million population.

Baseline: 289 new cases of end-stage renal disease per million population were reported in 1997.

Target setting method: Better than the best.

Data source: U.S. Renal Data System (USRDS), NIH, NIDDK.

NOTE: THE TABLE BELOW MAY CONTINUE TO THE FOLLOWING PAGE.

Total Population, 1997	New Cases of End-Stage Renal Disease
	Rate per Million
TOTAL	289
Race and ethnicity	
American Indian or Alaska Native	586
Asian or Pacific Islander	344
Asian	DNC
Native Hawaiian and other Pacific Islander	DNC
Black or African American	873
White	218
Hispanic or Latino	DNA
Not Hispanic or Latino	DNA
Black or African American	DNA
White	DNA
Gender	
Female	242
Male	348
Family income level	
Poor	DNC
Near poor	DNC
Middle/high income	DNC

Total Population, 1997	New Cases of End-Stage Renal Disease
	Rate per Million
Select populations	
Age groups	
Under 20 years	13
20 to 44 years	109
45 to 64 years	545
65 to 74 years	1,296
75 years and older	1,292

DNA = Data have not been analyzed. DNC = Data are not collected. DSU = Data are statistically unreliable.

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The current average annual increase in new cases of treated chronic kidney failure rates is 6 percent. Therefore, the expected rate in 2010 would be 612 new cases per million population. Without improvements in prevention and because of changes in demographics and increases in the number of cases of diabetes, rates of new cases of treated chronic kidney failure are expected to continue to rise 5 to 8 percent per year.

4-2. Reduce deaths from cardiovascular disease in persons with chronic kidney failure.

Target: 52 deaths per 1,000 patient years at risk.

Baseline: 70 deaths from cardiovascular disease per 1,000 patient years at risk (in persons with ESRD) occurred in 1997.

Target setting method: Better than the best.

Data source: U.S. Renal Data System (USRDS), NIH, NIDDK.

NOTE: THE TABLE BELOW MAY CONTINUE TO THE FOLLOWING PAGE.

Persons With Treated Chronic Kidney Failure, 1997	Deaths From Cardiovascular Disease
	Per 1,000 Patient Years at Risk
TOTAL	70
Race and ethnicity	
American Indian or Alaska Native	63
Asian or Pacific Islander	60
Asian	DNC

Persons With Treated Chronic Kidney Failure, 1997	Deaths From Cardiovascular Disease
	Per 1,000 Patient Years at Risk
Native Hawaiian and other Pacific Islander	DNC
Black or African American	62
White	75
Hispanic or Latino	DNA
Not Hispanic or Latino	DNA
Black or African American	DNA
White	DNA
Gender	
Female	73
Male	67
Family income level	
Poor	DNC
Near poor	DNC
Middle/high income	DNC

DNA = Data have not been analyzed. DNC = Data are not collected. DSU = Data are statistically unreliable.

NOTE: THE TABLE ABOVE MAY HAVE CONTINUED FROM THE PREVIOUS PAGE.

Cardiovascular disease is the major cause of death among patients with chronic renal failure and ESRD. Therefore, targeting reduction in CVD deaths will lead to a significant decrease in deaths for this population. The increased risk of CVD in kidney disease patients is evident before the onset of terminal kidney failure. Increases in the number of CVD deaths also are seen in individuals with proteinuria or elevated creatinine (both are markers of declining kidney function). CVD death rates in the treated chronic kidney failure population are estimated to be 30-fold higher than in the general population.[47] The known risk factors for CVD in the general population include age, male gender, diabetes, elevated cholesterol, high blood pressure, smoking, and family history. Elevated homocysteine levels in the blood also may be an important risk factor in treated chronic kidney failure patients and at earlier stages in the progression of kidney disease.[48, 49, 50] Strategies to reduce CVD deaths should target risk reduction before terminal kidney failure.[51] All responsible health care providers can initiate the strategies to reduce CVD deaths as suggested in published guidelines.[51]

4-3. Increase the proportion of treated chronic kidney failure patients who have received counseling on nutrition, treatment choices, and cardiovascular care 12 months before the start of renal replacement therapy.

Target: 60 percent.

Baseline: 45 percent of newly diagnosed patients with treated chronic kidney failure received counseling on nutrition, treatment choices, and cardiovascular care in 1996.

Target setting method: 33 percent improvement. (Better than the best will be used when data are available.)

Data source: U.S. Renal Data System (USRDS), NIH, NIDDK.

Newly Diagnosed Patients With Treated Chronic Kidney Failure, 1996	Received Counseling Prior to Renal Replacement Therapy
	Percent
TOTAL	45
Race and ethnicity	
American Indian or Alaska Native	DNA
Asian or Pacific Islander	DNA
Asian	DNC
Native Hawaiian and other Pacific Islander	DNC
Black or African American	DNA
White	DNA
Hispanic or Latino	DNA
Not Hispanic or Latino	DNA
Black or African American	DNA
White	DNA
Gender	
Female	DNA
Male	DNA
Family income level	
Poor	DNC
Near poor	DNC
Middle/high income	DNC

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Medically appropriate care of kidney disease patients within 12 months before the start of renal replacement therapy reduces the substantial illness, disability, and death associated with treated chronic kidney failure.[52] Appropriate preparation for RRT includes reduction in CVD risk factors, treatment of anemia, optimum therapy to preserve residual renal function, consultation about nutrition, and patient education about RRT methods. Patients should be seen by a specialist in RRT at least 12 months prior to initiation of RRT for general counseling. However, specific issues—such as vascular access and estimation of residual renal function—need to be addressed at least 6 months prior to RRT. Many patients with chronic renal failure are not seen by health care professionals who have RRT expertise until very near the time that RRT will be required. In a USRDS survey of 3,468 new dialysis patients, 55 percent had not been seen by a nephrologist 1 year prior to the start of RRT, and 33 percent had not been seen even 3 months before RRT.[53] Although control of diet is a major aspect of care for patients with chronic kidney failure and terminal kidney failure, by the start of RRT, 46 percent of the patients had not seen a dietitian.

4-4. Increase the proportion of new hemodialysis patients who use arteriovenous fistulas as the primary mode of vascular access.

Target: 50 percent.

Baseline: 29 percent of newly diagnosed patients with treated chronic kidney failure on hemodialysis used arteriovenous fistulas as the primary mode of vascular access in 1997.

Target setting method: 72 percent improvement (consistent with Dialysis Outcomes Quality Initiative [DOQI] guidelines). (Better than the best will be used when data are available.)

Data source: U.S. Renal Data System (USRDS), NIH, NIDDK.

NOTE: THE TABLE BELOW MAY CONTINUE TO THE FOLLOWING PAGE.

Newly Diagnosed Patients With Treated Chronic Kidney Failure on Hemodialysis, 1997	Arteriovenous Fistula Use
	Percent
TOTAL	29
Race and ethnicity	
American Indian or Alaska Native	DNA
Asian or Pacific Islander	DNA
Asian	DNC
Native Hawaiian and other Pacific Islander	DNC
Black or African American	DNA
White	DNA

Newly Diagnosed Patients With Treated Chronic Kidney Failure on Hemodialysis, 1997	Arteriovenous Fistula Use
	Percent
Hispanic or Latino	DNA
Not Hispanic or Latino	DNA
Black or African American	DNA
White	DNA
Gender	
Female	DNA
Male	DNA
Family income level	
Poor	DNC
Near poor	DNC
Middle/high income	DNC

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NOTE: THE TABLE ABOVE MAY HAVE CONTINUED FROM THE PREVIOUS PAGE.

Patients receiving renal replacement therapy as of December 31, 1997, were treated predominantly (72 percent) with dialysis. Of these, 88 percent were on hemodialysis. Vascular access is the major lifeline for hemodialysis patients. The presence of a functioning vascular access site represents a critical factor in the well-being of these patients. Unfortunately, however, it also is the largest single cause of illness and disability in patients receiving hemodialysis for renal replacement therapy, accounting for nearly 25 percent of all hospitalizations. Complications and problems related to vascular access have been estimated to account for as much as 17 percent of the health care costs associated with treated chronic kidney failure.[54]

Monitoring the type of vascular access for dialysis in new patients is an important method to assess the adequacy of preparation for RRT. Clinical evidence shows that patients with endogenous arteriovenous fistulas experience lower complication rates than patients with synthetic grafts. In the United States, the use rate for arteriovenous fistulas is under 30 percent.[55] Arteriovenous fistulas, ideally, should be placed at least 6 months before the start of dialysis. Early placement of arteriovenous fistulas is particularly important for elderly persons, because atherosclerotic vessels may take a much longer time to dilate to a usable diameter.

4-5. Increase the proportion of dialysis patients registered on the waiting list for transplantation.

Target: 66 percent of dialysis patients.

Baseline: 20 percent of newly diagnosed treated chronic kidney failure patients under age 70 years were registered on the waiting list in 1994–96.

Target setting method: Better than the best.

Data source: U.S. Renal Data System (USRDS), NIH, NIDDK.

Dialysis Patients Under Age 70 Years, 1994–96	Transplant Waiting List
	Percent
TOTAL	20
Race and ethnicity	
American Indian or Alaska Native	2
Asian or Pacific Islander	4
Asian	DNC
Native Hawaiian and other Pacific Islander	DNC
Black or African American	29
White	65
Hispanic or Latino	12
Not Hispanic or Latino	DNA
Black or African American	DNA
White	DNA
Gender	
Female	40
Male	60
Family income level	
Poor	DNC
Near poor	DNC
Middle/high income	DNC
Select populations	
Age groups	
Under 20 years	3
20 to 39 years	31
40 to 59 years	51
60 to 69 years	15

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Successful renal transplantation confers many advantages, including improvements in physical and psychological growth in children and improved survival and quality of life for recipients in general. The prospects of receiving a kidney transplant, however, are determined by a number of factors. These factors include age, primary cause of kidney failure, race and ethnic origin, gender, geographic location, and availability of suitable donors. Any combination of these factors may directly influence the first important step in the process of receiving a kidney transplant—namely, being registered on the waiting list. Significant disparities exist in the people who are registered on the waiting list. Women and people from certain racial and ethnic groups—particularly, African Americans—are less likely than other kidney transplant candidates to be registered on the waiting list.[40, 55, 56]

4-6. Increase the proportion of patients with treated chronic kidney failure who receive a transplant within 3 years of registration on the waiting list.

Target: 51 registrants per 1,000 patient years at risk.

Baseline: 41 registrants per 1,000 patient years at risk (since placed on dialysis) received a transplant within 3 years in 1995–97.

Target setting method: Better than the best.

Data source: U.S. Renal Data System (USRDS), NIH, NIDDK.

DATA NOTE: THE TABLE BELOW MAY CONTINUE TO THE FOLLOWING PAGE.

Renal Transplant Waiting List Registrants, 1995–97	Transplant Within 3 Years
	Rate per 1,000 Patient Years
TOTAL	41
Race and ethnicity	
American Indian or Alaska Native	30
Asian or Pacific Islander	DNA
Asian	50
Native Hawaiian and other Pacific Islander	DNA
Black or African American	30
White	49
Hispanic or Latino	DNA
Not Hispanic or Latino	DNA
Black or African American	DNA
White	DNA

Renal Transplant Waiting List Registrants, 1995–97	Transplant Within 3 Years
	Rate per 1,000 Patient Years
Gender	
Female	33
Male	49
Family income level	
Poor	DNC
Near poor	DNC
Middle/high income	DNC
Select populations	
Age groups	
Under 20 years	282
20 to 44 years	110
45 to 64 years	52
65 years and older	6

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NOTE: THE TABLE ABOVE MAY HAVE CONTINUED FROM THE PREVIOUS PAGE.

Individuals from certain racial and ethnic populations (specifically, African Americans) move up the waiting list to receive kidney transplants at a slower rate than whites.[57, 58] The exact causes are unclear. Racial and ethnic disparities in waiting times may be influenced by genetic and biological factors (such as HLA types),[59] the request and consent procedures of organ procurement organizations, patient registration practices for a center or region, organ acceptance practices at each transplant center, geographic location, socioeconomic status, cultural attitudes and beliefs about organ donation, rates of organ donation within each local area, and the donor pool.[42, 60]

Reports also have documented a lower rate of transplantation in women.[55] The U.S. Department of Health and Human Services (HHS) is working toward the goal of making sure that all persons in the United States have an equal opportunity to receive a transplant, regardless of who they are or where they live. To increase access to transplantation, HHS launched the National Organ and Tissue Donation Initiative to increase overall organ and tissue donation. One aspect of the initiative is to learn more about the factors that influence organ and tissue donation, with a special emphasis on certain racial and ethnic communities. Health care workers, particularly in the area of transplantation, need to understand the various obstacles to organ donation and transplantation, especially in the groups with which they work, and to initiate programs and policies that are culturally sensitive and meaningful.

4-7. Reduce kidney failure due to diabetes.

Target: 78 diabetic persons with new cases of ESRD per million population.

Baseline: 113 diabetic persons with new cases of ESRD per million population were reported in 1996.

Target setting method: Better than the best.

Data source: U.S. Renal Data System (USRDS), NIH, NIDDK.

NOTE: THE TABLE BELOW MAY CONTINUE TO THE FOLLOWING PAGE.

Persons With Diabetes, 1996	New Cases of ESRD
	Rate per Million
TOTAL	113
Race and ethnicity	
American Indian or Alaska Native	482
Asian or Pacific Islander	156
Asian	DNC
Native Hawaiian and other Pacific Islander	DNC
Black or African American	329
White	79
Hispanic or Latino	DNA
Not Hispanic or Latino	DNA
Black or African American	DNA
White	DNA
Gender	
Female	103
Male	112
Family income level	
Poor	DNC
Near poor	DNC
Middle/high income	DNC
Select populations	
Age groups	
Under 20 years	0
20 to 44 years	35
45 to 64 years	276

Persons With Diabetes, 1996	New Cases of ESRD
	Rate per Million
65 to 74 years	514
75 years and older	263

DNA = Data have not been analyzed. DNC = Data are not collected. DSU = Data are statistically unreliable.

NOTE: THE TABLE ABOVE MAY HAVE CONTINUED FROM THE PREVIOUS PAGE.

Convincing, consistent, and continuing scientific evidence shows that with secondary and tertiary prevention, microvascular complications of diabetes, especially diabetic kidney disease, can be reduced substantially. Enhanced quality of life, reductions in death rates, and reduced costs can result from improved clinical and public health diabetes prevention strategies directed at kidney disease and other microvascular and metabolic complications of diabetes. Monitoring the consequences of these strategies, including reductions in the magnitude of chronic renal insufficiency, terminal kidney failure, and other microvascular complications, should be an important component of an effective national public health program.

4-8. (Developmental) Increase the proportion of persons with type 1 or type 2 diabetes and proteinuria who receive recommended medical therapy to reduce progression to chronic renal insufficiency.

Potential data sources: National Ambulatory Medical Care Survey (NAMCS), CDC, NCHS; National Hospital Ambulatory Medical Care Survey (NHAMCS), CDC, NCHS.

Related Objectives From Other Focus Areas

1. Access to Quality Health Services
- 1-2. Health insurance coverage for clinical preventive services
- 1-3. Counseling about health behaviors
- 1-7. Core competencies in health provider training

5. Diabetes
- 5-2. New cases of diabetes
- 5-3. Overall cases of diagnosed diabetes
- 5-4. Diagnosis of diabetes
- 5-7. Cardiovascular disease deaths in persons with diabetes
- 5-11. Annual urinary microalbumin measurement
- 5-12. Annual glycosylated hemoglobin measurement

6. Disability and Secondary Conditions
- 6-1. Standard definition of people with disabilities in data sets
- 6-2. Feelings and depression among children with disabilities

6-3. Feelings and depression interfering with activities among adults with disabilities
6-5. Sufficient emotional support among adults with disabilities
6-6. Satisfaction with life among adults with disabilities
6-8. Employment parity

7. Educational and Community-Based Programs

7-7. Patient and family education
7-8. Satisfaction with patient education
7-9. Health care organization sponsorship of community health promotion activities
7-10. Community health promotion programs
7-11. Culturally appropriate and linguistically competent community health promotion programs

8. Environmental Health

8-11. Elevated blood lead levels in children
8-14. Toxic pollutants
8-20. School policies to protect against environmental hazards
8-22. Lead-based paint testing
8-25. Exposure to heavy metals and other toxic chemicals
8-26. Information systems used for environmental health
8-27. Monitoring environmentally related diseases
8-29. Global burden of disease

10. Food Safety

10-1. Foodborne infections
10-2. Outbreaks of foodborne infections
10-5. Consumer food safety practices
10-6 Safe food preparation practices in retail establishments

11. Health Communication

11-2. Health literacy
11-4. Quality of Internet health information sources
11-6. Satisfaction with health care providers' communication skills

12. Heart Disease and Stroke

12-1. Coronary heart disease (CHD) deaths
12-2. Knowledge of symptoms of heart attack and importance of calling 911
12-6. Heart failure hospitalizations
12-8. Knowledge of early warning symptoms of stroke
12-9. High blood pressure
12-10. High blood pressure control
12-11. Action to help control blood pressure
12-12. Blood pressure monitoring
12-16. LDL-cholesterol level in CHD patients

13. HIV

13-1. New AIDS cases
13-3. AIDS among persons who inject drugs
13-5. New HIV cases
13-8. HIV counseling and education for persons in substance abuse treatment
13-12. Screening for STDs and immunization for hepatitis B
13-17. Perinatally acquired HIV infection

14. Immunization and Infectious Diseases

- 14-1. Vaccine-preventable diseases
- 14-2. Hepatitis B in infants and young children
- 14-3. Hepatitis B in adults and high-risk groups
- 14-9. Hepatitis C
- 14-10. Identification of persons with chronic hepatitis C
- 14-16. Invasive early onset group B streptococcal disease
- 14-28. Hepatitis B vaccination among high-risk groups

16. Maternal, Infant, and Child Health

- 16-10. Low birth weight and very low birth weight

17. Medical Product Safety

- 17-1. Monitoring of adverse medical events
- 17-2. Linked, automated information systems
- 17-3. Provider review of medications taken by patients
- 17-6. Blood donations

19. Nutrition and Overweight

- 19-1. Healthy weight in adults
- 19-2. Obesity in adults
- 19-8. Saturated fat intake
- 19-17. Nutrition counseling for medical conditions

20. Occupational Safety and Health

- 20-7. Elevated blood lead levels from work exposure

22. Physical Activity and Fitness

- 22-2. Moderate physical activity
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23. Public Health Infrastructure

- 23-2. Public access to information and surveillance data
- 23-3. Use of geocoding in health data systems
- 23-4. Data for all population groups
- 23-5. Data for Leading Health Indicators, Health Status Indicators, and Priority Data Needs at State, Tribal, and local levels
- 23-6. National tracking of Healthy People 2010 objectives
- 23-7. Timely release of data on objectives
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25. Sexually Transmitted Diseases

- 25-3. Primary and secondary syphilis
- 25-8. Heterosexually transmitted HIV infection in women
- 25-10. Neonatal STDs
- 25-13. Hepatitis B vaccine services in STD clinics

27. Tobacco Use

- 27-1. Adult tobacco use
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- 27-10. Exposure to environmental tobacco smoke

Terminology

(A listing of abbreviations and acronyms used in this publication appears in Appendix H.)

Arteriovenous fistula: The type of vascular access created by joining a person's own (endogenous) artery to the nearby vein. The increase in blood flow in the vein leads to marked dilation of the vein and permits an easier insertion of needles for dialysis.

Chronic renal insufficiency, chronic renal failure, and end-stage renal disease (ESRD) (defined in this chapter as treated chronic kidney failure): Terms describing the continuum of increasing renal dysfunction and decreasing glomerular filtration rate (GFR). Because of the progressive nature of kidney disease, these terms represent successive stages of disease in most patients.

> **Chronic renal insufficiency:** The stage in chronic kidney disease in which damage to the kidney already has resulted in significant impairment of renal function, but systemic manifestations are minimal. Most patients who have chronic renal insufficiency are asymptomatic. Chronic renal insufficiency usually is identified because the serum creatinine is slightly elevated (greater than 1.5 mg/dL in males or 1.2 mg/dL in females and greater than age-specific normative values in children). The serum creatinine test is insensitive and does not identify all persons who have chronic renal insufficiency. Although precise GFR limits cannot be assigned to this stage of disease, typically patients with chronic renal insufficiency have a GFR between 30 ml/min and 75 ml/min.
>
> **Chronic renal failure:** The stage in chronic renal disease in which renal dysfunction has progressed to a level resulting in systemic manifestations. These manifestations include a rise in the blood concentration of urea, creatinine, and phosphate, which are removed by the kidneys, and other problems, such as anemia, bone disease, acidosis, and salt and fluid retention. Growth failure may be seen in children. Most patients with chronic renal failure progress to treated chronic kidney failure (end-stage renal disease).
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> **End-stage renal disease (ESRD) (referred to in this focus area as treated chronic kidney failure):** The stage in chronic renal disease in which renal replacement therapy, dialysis, or kidney transplantation is needed to sustain life. Treated chronic kidney failure is generally an irreversible state. The glomerular filtration rate is usually less than 10 ml/min.

Diabetes (diabetes mellitus): A chronic disease due to insulin deficiency or resistance to insulin action and associated with hyperglycemia (elevated blood glucose levels). Over time, without proper preventive treatment, organ complications related to diabetes develop, including heart, nerve, foot, eye, and kidney damage as well as problems with pregnancy. Diabetes is classified into two major categories.

Type 1 diabetes (previously called insulin-dependent diabetes mellitus [IDDM] or juvenile-onset diabetes [JODM]): Represents clinically about 5 percent of all persons with diagnosed diabetes. Its clinical onset typically occurs at ages under 30 years, with more gradual development after age 30. Most often type 1 diabetes represents an autoimmune destructive disease in the beta (insulin-producing) cells of the pancreas in genetically susceptible individuals. Insulin therapy always is required to sustain life and maintain diabetes control.

Type 2 diabetes (previously called noninsulin-dependent diabetes mellitus [NIDDM] or adult-onset diabetes [AODM]): Refers to the most common form of diabetes in the United States and the world, especially in certain racial and ethnic groups and in elderly persons. Women who develop diabetes during pregnancy also are at increased risk of developing this type of diabetes later in life. In the United States, approximately 95 percent of all persons with diagnosed diabetes (10.5 million) and 100 percent of all persons with undiagnosed (5.5 million) diabetes probably have type 2 diabetes.

Diabetic kidney disease: Kidney disease and resultant kidney functional impairment due to the longstanding effects of diabetes on the microvasculature of the kidney. Features include increased urine protein and decreased kidney function.

Dialysis: The process by which metabolic waste products are removed by cleansing of the blood directly through extracorporeal filtration membranes (hemodialysis) or indirectly by diffusion of waste products through the peritoneal membranes into instilled fluids (peritoneal dialysis).

End-stage renal disease: See above.

Glomerular filtration: The process by which the kidneys filter the blood, clearing it of toxins.

Glomerular filtration rate (GFR): The rate at which the blood is cleared by glomerular filtration and an important measure of kidney function. Normal GFR values in adults are between 100 and 150 ml/min. One of the most important hallmarks of chronic renal disease is a progressive decline in the rate of glomerular filtration. Generally, a GFR below 75 ml/min represents clinically significant renal insufficiency. A GFR of less than 10 ml/min represents kidney failure severe enough to require renal replacement therapy to maintain life.

Hemodialysis: The process by which biologic waste products are removed from the body through external blood circuit and external (artificial) membranes.

Glomerulonephritis: Inflammation in the primary filtration units (glomeruli) of the kidneys. Typically, this process leads to loss of blood, blood products, and protein into the urine. Unchecked or without effective treatment, this process could lead ultimately to permanent kidney damage and loss of kidney function and chronic kidney failure.

Incidence rate: A measure of the number of new cases of disease occurring in a specific population over a specific period of time, usually 1 year. For end-stage renal disease, the best information is based on the incidence of treated end-stage kidney disease reported through Medicare to the U.S. Renal Data System. Available data exclude those patients who die without receiving treatment.

Interstitial nephritis: Inflammation in the supporting matrix of the kidneys. This process could result from damage caused by microorganisms (such as bacteria and viruses) or from toxic reaction to drugs or other substances such as lead and mercury.

Microalbuminuria: Abnormally elevated levels of albumin in the urine—but at levels too low to be detectable by the dipstick method used to test for protein in the urine. Increased urinary excretion of albumin, even if the concentration is too low to be detectable as dipstick proteinuria, has been associated with increased risk of progressive kidney disease in people with diabetes[6, 7] and increased risk of subsequent death in persons with[8] and without diabetes[9, 10] and in elderly individuals.[11] Microalbuminuria can be measured in several ways. If a random urine sample is used, the albumin concentration in the first-voided morning urine or the ratio of urine albumin to urine creatinine can be used. If a timed urine collection is available, an albumin excretion rate can be determined. Urine albumin concentrations of 30 to 300 μg/ml, urinary albumin to creatinine ratios of less than 3.5 mg/mmol, and urine albumin excretion rates of less than 15 μg/min all have been used as cutoff values for detection of microalbuminuria.

Patient year (at risk): A measure of the duration (in years) a patient has been exposed to the effects of a particular biologic or physiologic condition, such as chronic renal insufficiency or the effects of dialysis.

Polycystic kidney disease: A disorder (usually inherited) of the kidneys in which the normal kidney structures (particularly, the tubules) are replaced by sacs (or cysts) that ultimately increase in size and lead to further destruction of the supporting matrix of the kidneys. The most common variety is the adult polycystic kidney disease (ADPKD), which is inherited as an autosomal dominant genetic disease. ADPKD is usually characterized

by elevated blood pressure, pain from enlarged cysts, blood in the urine, and a relentless progression to terminal kidney failure.

Prevalence rate: A measure of the total number of cases of disease existing in a specific population at a certain point in time (point prevalence) or over a certain period of time (period prevalence). Point-prevalence rates reflect the number of individuals at the stated date.

Proteinuria: Abnormal levels of protein in the urine. Proteinuria is a marker for structural kidney damage or inflammation and also may be involved in the pathogenesis of progressive renal injury. Increased risks of developing progressive renal disease,[1, 2] of death,[3, 4] and of death due to cardiovascular disease[5] have been documented in persons with persistent proteinuria. Urine protein can be estimated by a dipstick method, which provides a semiquantitative estimate of concentration. More accurate measures include determining the ratio of urine protein to urine creatinine or the amount of protein excreted by a person in a 24-hour period.

Renal disease: A synonym for kidney disease.

Serum creatinine: A blood chemistry measurement used to estimate the level of kidney function. Serum creatinine is an important index for monitoring progression of disease in persons with chronic renal disease. Elevations in serum creatinine are an insensitive marker of early chronic renal insufficiency. In advanced renal failure, however, a change in serum creatinine is a more reliable indicator. This test remains the most widely available method used to estimate the glomerular filtration rate or to monitor changes in level of renal function.[12]

U.S. Renal Data System (USRDS): A national database of information on treated chronic kidney failure patients—new cases, illness, disability, and death outcomes. USRDS is based predominantly on data collected by the Health Care Financing Administration's Medicare treated chronic kidney failure program and is funded by a contract from the National Institutes of Health.[13] This database contains information on approximately 93 percent of all patients treated for treated chronic kidney failure in the United States. Most of the data cited in this focus area derive from USRDS reports. As noted, these numbers reflect reported cases of treated end-stage renal disease and, therefore, do not include patients who die without treatment or patients whose care is not reported to USRDS.

Vascular access: The means by which blood is removed from a person for cleansing during dialysis and safely and easily returned, when cleaned, into the body.

Vasculitis: Inflammation of the blood vessels. Typically, the cause of this process is unknown. Untreated, it leads to progression to relentless and specific organ failures, including chronic kidney failure, or death.

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