



Chronic Kidney Disease

CHAPTER 4

Lead Agency

National Institutes of Health

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GOAL:

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



This chapter includes objectives that monitor new cases of Chronic Kidney Disease (CKD) and End Stage Renal Disease (ESRD), death and disability associated with ESRD, and treatments (including kidney transplantation) for CKD and ESRD and associated conditions.

All tracking data quoted in this chapter, along with technical information and Operational Definitions, can be found in the Healthy People 2010 database, DATA2010, available from <http://wonder.cdc.gov/data2010/>.

More information about this Focus Area can be found in the following publications:

- › *Healthy People 2010: Understanding and Improving Health*, available from <http://www.healthypeople.gov/2010/Document/tableofcontents.htm#under>.
- › *Healthy People 2010 Midcourse Review*, available from <http://www.healthypeople.gov/2010/data/midcourse/html/default.htm#FocusAreas>.

Highlights

- › Substantial progress was achieved for the objectives in this Focus Area over the course of the past decade [1]. Two thirds of the CKD objectives with data to measure progress moved toward or achieved their Healthy People 2010 targets (Figure 4-1). However, most objectives exhibited statistically significant health disparities of 10% or more by sex and among racial and ethnic population groups (Figure 4-2) [2].
- › Cardiovascular disease deaths among persons with chronic kidney failure (objective 4-2) declined 31.6% between 1997 and 2008, from 93.7 to 64.1 per 1,000 patient-years at risk. This decline exceeded the Healthy People 2010 target of 66.1 per 1,000

patient-years at risk. New cases of ESRD (objective 4-1) increased 12.1% between 1997 and 2008, from 313 to 351 per million population (adjusted for age, sex, and race), moving away from the Healthy People 2010 target of 230 per million population.

- › New cases of ESRD due to diabetes (objective 4-7) also increased 10.9% between 1997 and 2008, from 138 to 153 per million population (adjusted for age, sex, and race), moving away from the Healthy People 2010 target of 100 per million population.
- › The cumulative proportion of persons receiving a kidney transplant within 3 years of the date of renal failure (objective 4-6) declined 13.5% between 1998 and 2005, from 20.0% to 17.3%, moving away from the Healthy People 2010 target of 29.5%.
- › In 2005, Idaho and Utah, the Upper-Midwest (Minnesota, North and South Dakota, and Wisconsin), and Vermont had the highest cumulative proportions of persons receiving a kidney transplant within 3 years of the date of renal failure (objective 4-6). These states achieved the Healthy People 2010 target. On the other hand, California, the Southwest (New Mexico, Louisiana, and Texas), and the Southeast (Alabama, Georgia, and North and South Carolina) had the lowest cumulative proportions of persons receiving a kidney transplant within 3 years of the date of renal failure (Figure 4-3).
- › The registration of dialysis patients under age 70 for kidney transplantation (objective 4-5) varied by geographic area. In 2007, Delaware, Massachusetts, Pennsylvania, South Dakota, Vermont, and Wisconsin had the highest proportions of patients placed on the transplant waiting list within 1 year of an ESRD diagnosis. These states achieved the Healthy People 2010 target of 24.8% (Figure 4-4).

Summary of Progress

- › Figure 4-1 presents a quantitative assessment of progress in achieving the Healthy People 2010 objectives for CKD [1]. Data to measure progress toward target attainment were available for all nine objectives. Of these:
 - Three objectives exceeded the Healthy People 2010 targets (objectives 4-2, and 4-8a and b).
 - Three objectives moved toward their targets (objectives 4-3, 4-4, and 4-5). A statistically significant difference between the baseline and the final data points was observed for all these objectives.
 - Three objectives moved away from their targets (objectives 4-1, 4-6, and 4-7). A statistically significant difference between the baseline and final data points was observed for all these objectives.
- › Figure 4-2 provides a quantitative assessment of health disparities in CKD from the best group rate for each characteristic at the most recent data point [2]. It also displays changes in disparities from baseline to the most recent data point [3].
 - Of the seven objectives with statistically significant racial and ethnic health disparities of 10% or more, the Asian population (objectives 4-2 and 4-5), non-Hispanic white population (objectives 4-4 and 4-6), and the population of persons of two or more races (objectives 4-1 and 4-7), each had the best group rate for two objectives. The combined Asian or Pacific Islander population had the best group rate for one objective (4-8a).
 - Health disparities of 100% or more relative to the group with the best rate were observed for two objectives: new cases of ESRD (objective 4-1) and new ESRD cases due to diabetes (objective 4-7).
 - Increases in disparities of 100 percentage points or more were observed for the same two objectives.
 - Females had better rates than males for two of the three objectives with statistically significant health disparities of 10% or more by sex (objectives 4-1 and 4-7). Males had a better rate than females for new hemodialysis patients who use arteriovenous fistulas (objective 4-4).

Transition to Healthy People 2020

The Healthy People 2020 Chronic Kidney Disease Topic Area features a broader range of objectives than those included in Healthy People 2010. See [HealthyPeople.gov](https://www.healthypeople.gov) for a complete list of Healthy People 2020 topics and objectives.

The Healthy People 2020 objectives can be grouped into several sections:

- › CKD process and treatment
- › CKD outcomes
- › ESRD process and treatment
- › ESRD outcomes.

The differences between the Healthy People 2010 and Healthy People 2020 CKD objectives are summarized below:

- › The Healthy People 2020 CKD Topic Area has 24 objectives, whereas the Healthy People 2010 Focus Area had 9 objectives.
- › One Healthy People 2010 objective, new cases of ESRD (objective 4-1), was retained “as is” [4].
- › Eight Healthy People 2010 objectives (4-2 through 4-7, and 4-8a and b) were modified [5]. Some were extended to include new measures of CKD and ESRD treatment and outcomes.
- › Fifteen new objectives were added to the Healthy People 2020 Topic Area:
 - Five CKD and ESRD mortality objectives were added, namely: the total death and cardiovascular death rates for persons on dialysis; the death rate for dialysis patients within the first 3 months of initiating therapy; the total and cardiovascular death rates for persons who have had a kidney transplant; and the death rate for persons with CKD. (Objective 4-2, the Healthy People 2010 objective measuring cardiovascular death in patients with chronic kidney failure, was retained.)
 - Two objectives were added to the Healthy People 2010 objective on arteriovenous fistulas, monitoring the use of arteriovenous fistulas and the use of incident catheters.
 - Two new objectives focus on improving cardiovascular care in persons with CKD: blood pressure and hyperlipidemia control.
 - Objectives measuring the proportion of the U.S.

population with CKD and the proportion of persons with CKD who know they have impaired function were added to increase awareness of CKD among health professionals and the general public.

- Three new objectives address recommended medical evaluation and treatment of patients with diabetes and CKD.
- An objective measuring follow-up renal evaluation after acute kidney injury was included to emphasize the importance of timely evaluation in CKD prevention.

[Appendix D](#), “A Crosswalk Between Objectives From Healthy People 2010 to Healthy People 2020,” summarizes the changes between the two decades of objectives, reflecting new knowledge and direction for this area.

Data Considerations

Many of the objectives in this chapter are tracked using data from the United States Renal Data System (USRDS), which uses data collected by the Centers for Medicare & Medicaid Services. Since 1996, health care providers have been required to provide patient information on all persons with ESRD, regardless of health insurance. Therefore, incidence rates reflect the universe of ESRD cases in the U.S.

There is some lag in reporting new cases of ESRD. As a result, each year’s USRDS Annual Data Report includes re-estimates of rates from earlier years [6]. Data for some racial and ethnic groups have not been collected or reported for all years from the Healthy People 2010 baseline to the most recent data point. For example, data in the category “two or more races” for objectives 4-1 and 4-7 were not available until 2006. Therefore, due to the re-estimation method used by the Annual Data Report, data for these groups might not be directly comparable with other racial and ethnic groups.

The USRDS data, data collection procedures, calculation methods, and other technical information are included in the USRDS Annual Data Report [6].

Education and income are the primary measures of socioeconomic status in Healthy People 2010. Most data systems used in Healthy People 2010 define income as a family’s income before taxes. To facilitate comparisons among groups and over time, while adjusting for family size and for inflation, Healthy People 2010 categorizes income using the poverty thresholds developed by the Census Bureau. Thus, the three categories of family income that are primarily used are:

- › Poor—below the Federal poverty level

- › Near poor—100% to 199% of the Federal poverty level
- › Middle/high income—200% or more of the Federal poverty level.

These categories may be overridden by considerations specific to the data system, in which case they are modified as appropriate. See *Healthy People 2010: General Data Issues*, referenced below.

Additional information on data issues is available from the following sources:

- › All Healthy People 2010 tracking data can be found in the Healthy People 2010 database, DATA2010, available from <http://wonder.cdc.gov/data2010/>.
- › Detailed information about the data and data sources used to support these objectives can be found in the Operational Definitions on the DATA 2010 website, available from <http://wonder.cdc.gov/data2010/focusod.htm>.
- › More information on statistical issues related to Healthy People tracking and measurement can be found in the [Technical Appendix](#) and in *Healthy People 2010: General Data Issues*, which is available in the General Data Issues section of the NCHS Healthy People website under Healthy People 2010; see http://www.cdc.gov/nchs/healthy_people/hp2010/hp2010_data_issues.htm.

References and Notes

1. Displayed in the Progress Chart (Figure 4-1), the percent of targeted change achieved expresses the difference between the baseline and the final value relative to the initial difference between the baseline and the Healthy People 2010 target. As such, it is a relative measure of progress toward attaining the Healthy People 2010 target. See the [Reader’s Guide](#) for more information. When standard errors were available, the difference between the baseline and the final value was tested at the 0.05 level of significance. See the Figure 4-1 footnotes, as well as the [Technical Appendix](#), for more detail.
2. Information about disparities among select populations is shown in the Health Disparities Table (Figure 4-2). Disparity from the best group rate is defined as the percent difference between the best group rate and each of the other group rates for a characteristic. For example, racial and ethnic health disparities are measured as the percent difference between the best racial and ethnic group rate and each of the other racial and ethnic group rates. Similarly, disparities by sex are measured as

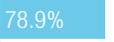
the percent difference between the better group rate (e.g., female) and the rate for the other group (e.g., male). Some objectives are expressed in terms of favorable events or conditions that are to be increased, while others are expressed in terms of adverse events or conditions that are to be reduced. To facilitate comparison of health disparities across different objectives, disparity is measured only in terms of adverse events or conditions. For comparability across objectives, objectives that are expressed in terms of favorable events or conditions are re-expressed using the adverse event or condition for the purpose of computing disparity, but they are not otherwise restated or changed. For example, objective 1-1, to increase the proportion of persons with health insurance (e.g., 72% of the American Indian or Alaska Native population under age 65 had some form of health insurance in 2008), is expressed in terms of the percentage of persons without health insurance (e.g., $100\% - 72\% = 28\%$ of the American Indian or Alaska Native population under age 65 did not have any form of health insurance in 2008) when the disparity from the best group rate is calculated. See the [Reader's Guide](#) for more information. When standard errors were available, the difference between the best group rate and each of the other group rates was tested at the 0.05 level of significance. See the Figure 4-2 footnotes, as well as the [Technical Appendix](#), for more detail.

3. The change in disparity is estimated by subtracting the disparity at baseline from the disparity at the most recent data point and, therefore, is expressed in percentage points. See the [Reader's Guide](#) for more information. When standard errors were available, the change in disparity was tested at the 0.05 level of significance. See the Figure 4-2 footnotes, as well as the [Technical Appendix](#), for more detail.
4. As of the Healthy People 2020 launch, Healthy People 2020 objectives that were retained "as is" from Healthy People 2010 had no change in the numerator or denominator definitions, the data source(s), or the data collection methodology. These include objectives that were developmental in Healthy People 2010 and are developmental in Healthy People 2020, and for which no numerator information is available.
5. As of the Healthy People 2020 launch, objectives that were modified from Healthy People 2010 had some change in the numerator or denominator definitions, the data source(s), or the data collection methodology. These include objectives that went from developmental in Healthy People 2010 to measurable in Healthy People 2020, or vice versa.
6. United States Renal Data System (USRDS). *2010 Annual Data Report: Atlas of End-Stage Renal Disease in the United States*. Bethesda, MD: National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, 2010. Available from <http://www.usrds.org/adr.htm>.

Comprehensive Summary of Objectives: Chronic Kidney Disease

Objective	Description	Data Source or Objective Status
4-1	New cases of end-stage renal disease (ESRD) (per million population, adjusted for age, sex, and race)	United States Renal Data System (USRDS), NIH, NIDDK.
4-2	Cardiovascular disease deaths in persons with chronic kidney failure (per 1,000 patient years at risk)	United States Renal Data System (USRDS), NIH, NIDDK.
4-3	Pre-ESRD care from a nephrologist	United States Renal Data System (USRDS), NIH, NIDDK.
4-4	New hemodialysis patients who use arteriovenous fistulas (20+ years)	Centers for Medicare and Medicaid Services Clinical Performance Measures (CPM) project, CMS.
4-5	Dialysis patients registered on kidney transplant waiting list (<70 years)	United States Renal Data System (USRDS), NIH, NIDDK.
4-6	Cumulative percent of persons receiving a kidney transplant within 3 years of the date of renal failure (<70 years)	United States Renal Data System (USRDS), NIH, NIDDK.
4-7	New cases of ESRD due to diabetes (per million population, adjusted for age, sex, and race)	United States Renal Data System (USRDS), NIH, NIDDK.
4-8a	Medical evaluation for persons with type 1 or type 2 diabetes and chronic kidney disease	Centers for Medicare & Medicaid Services Standard Analytic Files (SAF), CMS; United States Renal Data System (USRDS), NIH, NIDDK.
4-8b	Medical treatment for persons with type 1 or type 2 diabetes and chronic kidney disease	Centers for Medicare and Medicaid Services Standard Analytic Files (SAF), CMS; United States Renal Data System (USRDS), NIH, NIDDK.

Figure 4-1. Progress Toward Target Attainment for Focus Area 4: Chronic Kidney Disease

LEGEND		 Moved away from target ¹	 Moved toward target	 Met or exceeded target						
Objective	Percent of targeted change achieved ²	2010 Target	Baseline (Year)	Final (Year)	Baseline vs. Final					
					Difference ³	Statistically Significant ⁴	Percent Change ⁵			
4-1. New cases of end-stage renal disease (ESRD) (per million population, adjusted for age, sex, and race)		230	313 (1997)	351 (2008)	38	Yes	12.1%			
4-2. Cardiovascular disease deaths in persons with chronic kidney failure (per 1,000 patient-years at risk)		66.1	93.7 (1997)	64.1 (2008)	-29.6	Yes	-31.6%			
4-3. Pre-ESRD care from a nephrologist		34%	25% (2005)	28% (2008)	3	Yes	12.0%			
4-4. New hemodialysis patients who use arteriovenous fistulas (20+ years)		45%	26% (1998)	41% (2007)	15	Yes	57.7%			
4-5. Dialysis patients registered on kidney transplant waiting list (<70 years)		24.8%	15.2% (1998)	17.1% (2007)	1.9	Yes	12.5%			
4-6. Cumulative percent of persons receiving a kidney transplant within 3 years of the date of renal failure (<70 years)		29.5%	20.0% (1998)	17.3% (2005)	-2.7	Yes	-13.5%			
4-7. New cases of ESRD due to diabetes (per million population, adjusted for age, sex, and race)		100	138 (1997)	153 (2008)	15	Yes	10.9%			
4-8a. Medical evaluation for persons with type 1 or type 2 diabetes and chronic kidney disease		25%	21% (2000)	34% (2008)	13	Yes	61.9%			
4-8b. Medical treatment for persons with type 1 or type 2 diabetes and chronic kidney disease		71%	69% (2000)	74% (2006)	5	No	7.2%			

NOTES

See the [Reader's Guide](#) for more information on how to read this figure. See DATA 2010 at <http://wonder.cdc.gov/data2010> for all Healthy People 2010 tracking data.

FOOTNOTES

¹ Movement away from target is not quantified using the percent of targeted change achieved. See [Technical Appendix](#) for more information.

² Percent of targeted change achieved = $\frac{\text{Final value} - \text{Baseline value}}{\text{Healthy People 2010 target} - \text{Baseline value}} \times 100$.

³ Difference = Final value - Baseline value. Differences between percents (%) are measured in percentage points.

⁴ When estimates of variability are available, the statistical significance of the difference between the final value and the baseline value is assessed at the 0.05 level. See [Technical Appendix](#) for more information.

⁵ Percent change = $\frac{\text{Final value} - \text{Baseline value}}{\text{Baseline value}} \times 100$.

DATA SOURCES

- 4-1-4-3. United States Renal Data System (USRDS), NIH, NIDDK.
- 4-4. Centers for Medicare & Medicaid Services Clinical Performance Measures (CPM) project, CMS.
- 4-5-4-7. United States Renal Data System (USRDS), NIH, NIDDK.
- 4-8a-b. Centers for Medicare & Medicaid Services Standard Analytic Files (SAF), CMS; United States Renal Data System (USRDS), NIH, NIDDK.

Figure 4-2. Health Disparities Table for Focus Area 4: Chronic Kidney Disease

Disparities from the best group rate for each characteristic at the most recent data point and changes in disparity from the baseline to the most recent data point.

Population-based objective	Race and Ethnicity							Summary index	Sex		Income		
	American Indian or Alaska Native	Asian	Native Hawaiian or Other Pacific Islander	Two or more races	Hispanic or Latino	Black, not Hispanic	White, not Hispanic		Female	Male	Poor	Near poor	Middle/high income
4-1. New cases of end-stage renal disease (ESRD) (per million population, adjusted for age, gender, and race) (1997, 2008) [§]	↑	↑↑	↑↑	B ⁱ	↑↑	↑↑	↑	ii	B	↑			
4-2. Cardiovascular disease deaths in persons with chronic kidney failure (per 1,000 patient-years at risk) (1997, 2008)	↓	B				↑		ii	B ⁱ				
4-3. Pre-ESRD care from a nephrologist (2005, 2008)					B ⁱ				B ⁱ				
4-4. New hemodialysis patients who use arteriovenous fistulas (20+ years) (1998, 2007)	b	iii					B ⁱ			B			
4-5. Dialysis patients registered on kidney transplant waiting list (<70 years) (1998, 2007)		B	↑					ii		B			
4-6. Cumulative percent of persons receiving a kidney transplant within 3 years of the date of renal failure (<70 years) (1998, 2005)							B	ii		B			
4-7. New cases of ESRD due to diabetes (per million population, adjusted for age, sex, and race) (1997, 2008) [§]	↑	↑↑	↑	B ⁱ	↑↑	↑↑	↑	ii	B	↑			
4-8a. Medical evaluation for persons with type 1 or type 2 diabetes and chronic kidney disease (2000, 2008)		B ⁱⁱⁱ				iv	iv		B ⁱ				
4-8b. Medical treatment for persons with type 1 or type 2 diabetes and chronic kidney disease (2000, 2006)													

NOTES

See DATA2010 at <http://wonder.cdc.gov/data2010> for all Healthy People 2010 tracking data.

Years in parentheses represent the baseline and most recent data years (if available).

Disparity from the best group rate is defined as the percent difference between the best group rate and each of the other group rates for a characteristic (e.g., race and ethnicity). The summary index is the average of these percent differences for a characteristic. Change in disparity is estimated by subtracting the disparity at baseline from the disparity at the most recent data point. Change in the summary index is estimated by subtracting the summary index at baseline from the summary index at the most recent data point. See [Technical Appendix](#) for more information.

Measures of variability were available for all objectives in this table. Thus, the variability of best group rates was assessed, and statistical significance was tested. Disparities of 10% or more are displayed when the differences from the best group rate are statistically significant at the 0.05 level. Changes in disparities over time are indicated by arrows when the changes are greater than or equal to 10 percentage points and are statistically significant at the 0.05 level. See [Technical Appendix](#).

Figure 4-2. Health Disparities Table for Focus Area 4: Chronic Kidney Disease (continued)

LEGEND			
The “best” group rate at the most recent data point.		The group with the best rate for specified characteristic.	
		Most favorable group rate for specified characteristic, but reliability criterion not met.	
			Reliability criterion for best group rate not met, or data available for only one group.
Percent difference from the best group rate			
Disparity from the best group rate at the most recent data point.		Less than 10%, or difference not statistically significant (when estimates of variability are available).	 10%–49%  50%–99%  100% or more
Changes in disparity over time are shown when: (a) disparities data are available at both baseline and most recent time points; (b) data are not for the group(s) indicated by “B” or “b” at either time point; and (c) the change is greater than or equal to 10 percentage points and statistically significant, or when the change is greater than or equal to 10 percentage points and estimates of variability were not available. See Technical Appendix .	Increase in disparity (percentage points)		
		10–49 points	 50–99 points  100 points or more
	Decrease in disparity (percentage points)		
		10–49 points	 50–99 points  100 points or more
Availability of Data		Data not available.	
			Characteristic not selected for this objective.

FOOTNOTES

[§] Data for “two or more races” were not available until 2006; therefore, these data may not be directly comparable with other groups. See Data Considerations section for more information.

ⁱ The group with the best rate at the most recent data point is different from the group with the best rate at baseline. Both rates met the reliability criterion. See [Technical Appendix](#).

ⁱⁱ Change in the summary index cannot be assessed. See [Technical Appendix](#).

ⁱⁱⁱ Data are for Asian or Pacific Islander.

^{iv} Data include persons of Hispanic origin.

DATA SOURCES

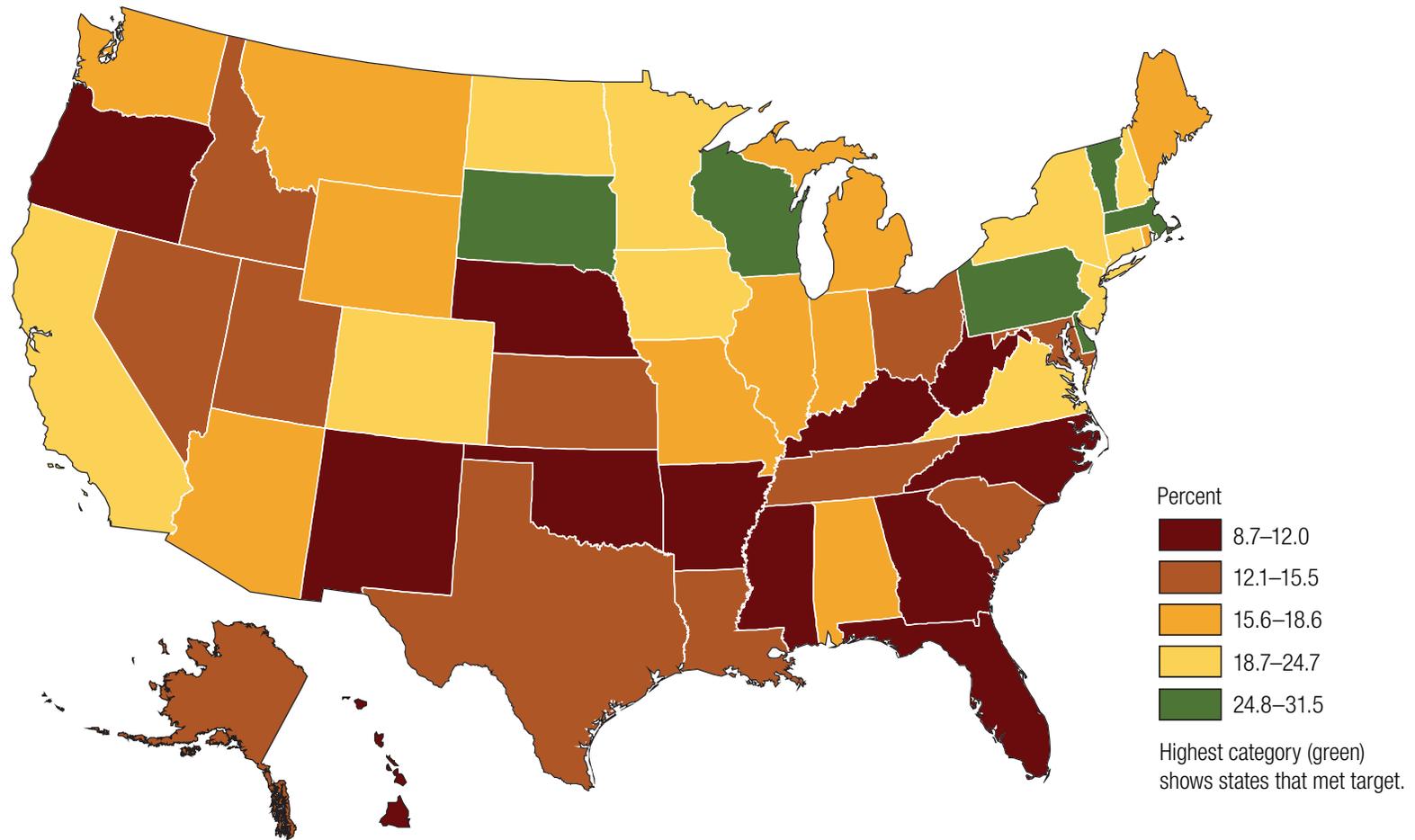
4-1–4-3. United States Renal Data System (USRDS), NIH, NIDDK.

4-4. Centers for Medicare & Medicaid Services Clinical Performance Measures (CPM) project, CMS.

4-5–4-7. United States Renal Data System (USRDS), NIH, NIDDK.

4-8a–b. Centers for Medicare & Medicaid Services Standard Analytic Files (SAF), CMS; United States Renal Data System (USRDS), NIH, NIDDK.

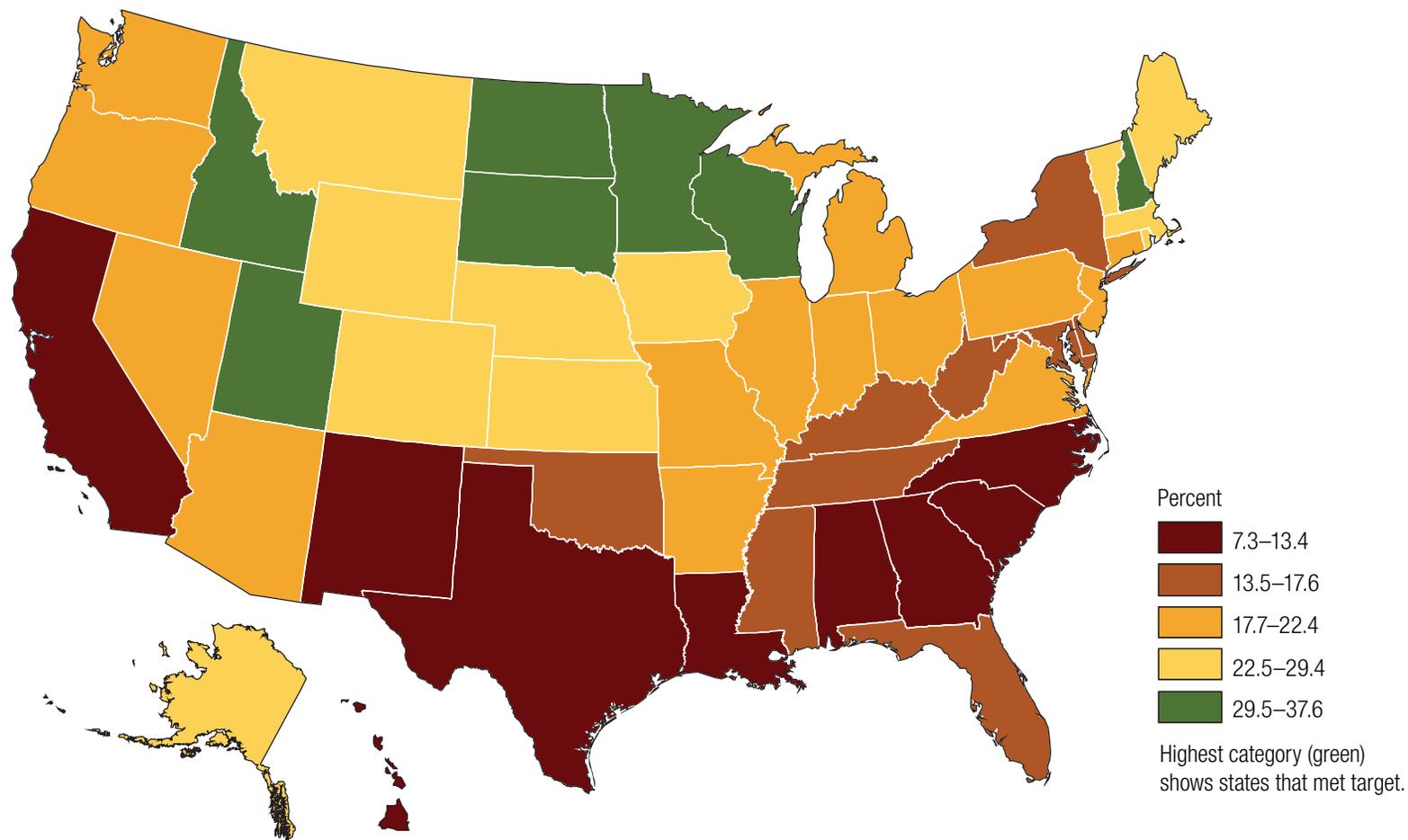
Figure 4-3. Dialysis Patients Registered on Kidney Transplant Waiting List (Age <70), 2007
 Healthy People 2010 objective 4-5 • Target = 24.8 percent



NOTES: Data are for dialysis patients under age 70 registered on the kidney transplant waiting list within 1 year of the date of ESRD. Rates are displayed by a modified Jenks classification for U.S. states. The USRDS data, data collection procedures, calculation methods, and other technical information are included in the USRDS Annual Data Report, available from <http://www.usrds.org/adr.htm>.

SOURCE: United States Renal Data System (USRDS), NIH, NIDDK.

Figure 4-4. Cumulative Percent of Persons Receiving a Kidney Transplant Within 3 Years of the Date of Renal Failure (Age <70), 2005
 Healthy People 2010 objective 4-6 • Target = 29.5 percent



NOTES: Data are for patients with treated chronic kidney failure who receive a transplant within 3 years of registration on the waiting list. Rates are displayed by a modified Jenks classification for U.S. states. The USRDS data, data collection procedures, calculation methods, and other technical information are included in the USRDS Annual Data Report, available from <http://www.usrds.org/adr.htm>.

SOURCE: United States Renal Data System (USRDS), NIH, NIDDK.