## CKD Reference Table Methods

### *REFERENCE TABLE B: PREVALENCE*

Reference Tables B.1–B.6 present estimated point prevalent (December 31) counts of all fee-for-service non-ESRD Medicare population, based on the 5% Medicare sample, for adults aged 18 and older rather than the age eligible (aged 65 and older) cohort presented in Volume 1, Chapter 2: Identification and Care of Patients with CKD. Each year's cohort included all patients alive and without ESRD, who were continuously enrolled in Medicare Parts A and B, and not enrolled in a Medicare Advantage program for the entire reported calendar year. Age was calculated as of December 31 of the year. Race and sex were provided by the Master Beneficiary Summary File. Dual eligibility is defined on the January 1st of the reported year. The disease conditions of CKD, heart failure (HF), and diabetes mellitus (DM) and the stage of CKD were determined from claims in the reported year, using the methods described in the Identification of Major Comorbidities section of this chapter and the diagnosis codes listed in excel file "Codes for Comorbidity and CKD_2024xlsx". Counts were multiplied by 20 to represent 100% of the Medicare population meeting the cohort definition.

The data source for Reference Tables B.7-B.9 consisted of National Health and Nutrition Examination Survey (NHANES) 2005-2008, 2009-2012, 2013-2016, and 2017-March, 2020 participants aged ≥20 years. The sample, which is updated biennially but which was curtailed in March 2020 due to the COVID-19 pandemic, is representative of the non-institutionalized U.S. population, with oversampling of certain subgroups to increase reliability and precision of health indicator estimates. B.8 and B.9 each required an additional condition (see details below). Single-sample, calibrated estimates of serum creatinine and ACR were used. Estimated glomerular filtration rate (eGFR) was obtained from one serum creatinine measurement and calculated using the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equation (Levey et al., 2009) and a new creatinine-based eGFR equation without a race adjustment factor was used in this year's ADR (Inker et al., 2021). CKD was defined based on Kidney Disease: Improving Global Outcomes (KDIGO) guidelines as having an eGFR < 60 mL/min/1.73m$^2$ or ACR >=30 mg/g.

Table B.7. Definitions: diabetes, affirmative self-report, medication for diabetes, or glycosylated hemoglobin ≥7%; hypertension, anti-hypertensive medication, systolic blood pressure ≥130 mmHg, or diastolic blood pressure ≥80 mmHg; cardiovascular disease, affirmative self-report of myocardial infarction, affirmative self-report of congestive heart failure, or affirmative self-report of stroke; obesity, body mass index ≥30 kg/m².

Table B.8. In addition to the condition listed above, participants were limited to those with CKD. Definitions: those listed for Table B.7; CKD, defined based on Kidney Disease: Improving Global Outcomes (KDIGO) guidelines as having an eGFR <60 mL/min/1.73m$^2$ or ACR ≥30 mg/g. The consensus definition of CKD requires two measurements of both eGFR and ACR meeting the criteria above within a three-month period, but only one measurement of each is available in NHANES. Therefore, the resulting numbers may overestimate the true number of CKD patients in the general U.S. population. Abbreviations: CKD, chronic kidney disease; eGFR, estimated glomerular filtration rate; ACR, albumin to creatinine ratio.

Table B.9. In addition to the condition listed above in Table B.7, participants were limited to those with serum creatinine and urinary ACR measurements. Definitions: those listed for Table B.7. Abbreviations: DM, diabetes mellitus; eGFR, estimated glomerular filtration rate; ACR, albumin to creatinine ratio.

## *REFERENCE TABLE K: HEALTHCARE EXPENDITURES*

In Tables K.1–K.5 we present estimates of per person per year Parts A, B, and D Medicare expenditures for point prevalent (December 31) general Medicare fee-for-service beneficiaries overall, with CKD, with DM, with HF, and without CKD/DM/HF, respectively. Data was derived from the 5% Medicare sample. Methods for these tables were the same as those described in the section of Chapter 6: Healthcare Expenditures for Persons with CKD. Reference Table K includes all adult patients aged 18years and older and age was defined as of January 1st of the reported year. New in 2024 ADR, we report total years at risk (Tables K.1s–K.5s) for point prevalent (December 31) general Medicare fee-for-service beneficiaries overall, with CKD, with DM, with HF, and without CKD/DM/HF, respectively.

## *REFERENCE TABLE O: DRUG UTILIZATION*

References Tables O.1–O.2 present the top drugs classes used in 2022 among fee-for-service Medicare beneficiaries with CKD. These results are an expansion of the results presented in Volume 1, Chapter 7: Prescription Drug Coverage in Patients with CKD (i.e., whereas the Chapter 7 results present the top 15 drug classes, these tables present the top 50 drug classes). These tables include point prevalent beneficiaries from the Medicare 5% sample who were aged 66-105 years, resided in the 50 U.S. states, the District of Columbia, or the U.S. territories, and were enrolled in Medicare Parts A, B, and D (and not enrolled in Medicare Advantage) on January 1, 2022. Furthermore, these beneficiaries were also alive without ESRD and were enrolled in Medicare Parts A and B (and not enrolled in Medicare Advantage) from January 1, 2021 to December 31, 2021. CKD was determined based on having relevant ICD-10-CM diagnosis codes on at least one inpatient or two outpatient claims during 2021. Refer to the section **Identification of Chronic Kidney Disease and Major Comorbidities DATA SOURCES for CKD Volume, 2024 USRDS ADR** for the complete methodology and relevant diagnosis codes used to identify CKD.

Prescription drug claims occurring during follow-up in 2022 among fee-for-service Medicare beneficiaries with CKD were matched to a therapeutic class according to the Medi-Span Generic Product Identifier (GPI) classification system. The National Drug Code (NDC) numbers used to identify each drug class are shown in the Excel file (**Codes for Prescription Drug Classes.xlsx**) that is located in the Analytical Methods for Volume 1. Drug classes were ranked two ways: by the percentage of beneficiaries who filled at least one prescription for a given class, and by the total insurance spending for a given class. The top 50 drug classes for each ranking method are shown in Reference Tables O.1 and O.2. In addition to showing total spending for each of the 50 drug classes, Table O.2 also shows spending per enrollee and per drug class user, as well as the percentage receiving each drug class. The total spending for all covered medications is also shown at the bottom of Table O.2. The per enrollee and per drug class user spending values can be used to differentiate costly drug classes in terms of being inexpensive drugs used by a large number of enrollees (e.g., antibiotics) versus very expensive drugs used by a minority of enrollees (e.g., antiretrovirals).

## ESRD Reference Table Methods

### *REFERENCE TABLES A: INCIDENCE AND B: PREVALENCE*

The data sources for information on both incident and prevalent patients are the ESRD Medical Evidence form (CMS 2728), OPTN, and US population data from the U.S. Census Bureau and the CDC. Incidence refers to the new cases of ESRD during a given time period. Incidence is expressed as a rate (number/million population/year). Prevalence refers to all patients receiving ESRD treatment at a particular time (December 31) and is expressed as a proportion (number/million population). A patient is considered incident at the time of first transplantation or first regular dialysis for chronic renal failure. A patient is considered prevalent if he/she is known to be receiving dialysis treatment or to have a functioning kidney transplantation on a certain date (point prevalence) or within a specified time period (period prevalence). Both incidence rates and prevalence are adjusted to a reference population using the direct method.

The 2024 ESRD Reference Tables present parallel sets of counts and rates for incidence (Table A) and December 31 point prevalence (Table B) from 2002 to 2022. Reference Table B also presents annual period prevalent counts (B.12) and counts of lost to follow-up patients (those who lack any evidence of payment activity in the Medicare database for one year, B.1).

The data in Reference Tables A and B should be considered complete for 2022, although the prevalence or incidence counts for a given year may have small changes later due to lag time, patients with recovered renal function, and patients who die before chronic dialysis treatment is fully established. Note that the incident patients who stop chronic dialysis and then restart are counted as prevalent, and incident patients who have a modality change, i.e., return to dialysis after a failed transplant, are not counted as incident ESRD patients.

Patients with unknown age are dropped in all tables. For incident patients, age is computed as of the beginning of ESRD therapy while for prevalent patients, age is computed as of December 31 of the year. Patients with unknown/other or multiracial race, sex or ethnicity are dropped based on different requirements as presented below.

- No exclusions (except unknown age) are made for these tables:
  - A.1; A.6; A.6(1); A.7; A.7(2); A.8; A.8(2); A.8(3) and A.10.
  - B.1; B.6; B.6(1); B.7; B.7(2); B.8; B.8(2); B.8(3); B.10 and B.12.
- Unknown and other/multiracial races are dropped in these tables:
  - A.1(2); A.1.1-A.1.4; A.2; A.2(2); A.2.1-A.2.4; A.3; A.3.1; A.4; A.4.1; A.5; all A.5.1; A.8.1; A.8.1(2); A.9; A.9(2); A.9(3) and A.11.
  - B.1(2); B.1.1-B.1.4; B.2; B.2(2); B.2.1-B.2.4; B.3; B.3.1; B.4; B.4.1; B.5; all B.5.1; B.8.1; B.8.1(2); B.9; B.9(2); B.9(3) and B.11.
- Unknown sex and unknown ethnicity are dropped in these tables:
  - A.1(2); A.1.1-A.1.4; A.2; A.2(2); A.2.1-A.2.4; A.3; A.3.1; A.4; A.4.1; A.5; all A.5.1; A.8.1; A.8.1(2); A.9; A.9(2); A.9(3) and A.11.
  - B.1(2); B.1.1-B.1.4; B.2; B.2(2); B.2.1-B.2.4; B.3; B.3.1; B.4; B.4.1; B.5; all B.5.1; B.8.1; B.8.1(2); B.9; B.9(2); B.9(3) and B.11.
- Unknown ESRD network is dropped in Tables A.11 and B.11.
- The “Other cause” category in primary diagnosis (cause of ESRD) in Tables A.4, A.5, B.4, and B.5, includes patients with cystic kidney disease, other urologic diseases, other causes, unknown cause,

and missing cause categories that are listed in the eight category primary diagnosis groups used in Table A.1 and B.1.

- "Other race" includes Asian, Native American, and Native Hawaiian or Pacific Islander in these tables:
  - A.1.1-A.1.4; A.2.1- A.2.4 and A.3.
  - B.1.1-B.1.4; B.2.1- B.2.4 and B.3.
- Because the U.S. population (shown in Reference Table M) used in the ADR includes only residents of the 50 states and the District of Columbia, most tables are limited to patients from these areas. However, the following tables present data specific to patients in Puerto Rico and the U.S. territories, or include these patients in the total patient population.
  - A.1; A.6; A.6(1); A.7; A.7(2); A.8; A.8(2); A.8(3); and A.10.
  - B.1; B.6; B.6(1); B.7; B.7(2); B.8; B.8(2); B.8(3); B.10; and B.12.
- Rates in these tables are adjusted for age, sex, race/ethnicity with the 2015 national population as reference:
  - A.2(2); A.2.1-A.2.4; A.3.1; A.5; all A.5.1; A.9; A.9(2); A.9(3) and A.11.
  - B.2(2); B.2.1-B.2.4; B.3.1; B.5; all B.5.1; B.9; B.9(2); B.9(3) and B.11.
- Rates in Tables A.3 and B.3 unadjusted and adjusted for age, sex, and race/ethnicity with the CDC diabetes population estimates used as the denominator.

A new Medical Evidence form (CMS 2728) version was released in 2015 to switch to ICD-10-CM diagnosis codes. To continue the detailed diagnosis categories in Tables A.7 and B.7, clinicians reviewed the diagnoses listed on the 2015 Medical Evidence form and classified them into the pre-2015 detailed cause of ESRD groupings. Some detailed groupings are only classified under the ICD-9-CM system. As such, relevant rows this year represent smaller case counts in B.7 tables than in previous years, and are blank in A.7 tables. Specific definitions are provided in the Excel file "Cause of ESRD" in the Analytical Methods of the ESRD Volume.

## *REFERENCE TABLE C: PATIENT CHARACTERISTICS*

Data in Reference Table C are based on information collected with the 2005, 2015, and 2018 Medical Evidence forms (CMS 2728). The full title of the form is "End-Stage Renal Disease Medical Evidence Report, Medicare Entitlement and/or Patient Registration".

Extreme and implausible laboratory results values are excluded from the analysis, see table RC.1 for acceptable ranges.

**Table RC.1 Acceptable values for laboratory results**

| Measurement name | Range | Units |
|---|---|---|
| Serum albumin | 0.5-6.5 | g/dL |
| Serum creatinine | 0.1-33.0 | mg/dL |
| Hematocrit | 9-60 | % |
| Hemoglobin | 3-20 | g/dL |
| Hemoglobin A1c | 3-30 | % |
| Height | 15-250 | cm |
| Weight | 0.45-250 | kg |
| Total cholesterol | 30-1200 | mg/dL |
| Low-density lipoprotein | 30-350 | mg/dL |
| High-density lipoprotein | 1-110 | mg/dL |
| Triglycerides | 10-10,000 | mg/dL |
| Body mass index | 10-80 | kg/m2 |

Each table in Reference Table C shows population characteristics by age, sex, race/ethnicity, and primary cause of ESRD. Mid-East/Arabian race and Indian Subcontinent race were dropped from the 2005 form, therefore, Mid-East/Arabian and Indian Subcontinent are not shown in the tables. Data shown are based on the incident population with a completed Medical Evidence form within the given year. Tables C1-C3 use data for three years combined for three time periods (2014-2016, 2017-2019, and 2020-2022). Tables C.4-C.6 and C.11 show two time periods (2017-2019 and 2020-2022) while Tables C.7-C.10 show all years from 2018-2022.

Table C.1 contains data on biochemical markers (item 19 on CMS 2728) for 2014-2016 (C.1), 2017-2019 (C.1(2)), and 2020-2022 (C.1(3)). Glycosylated hemoglobin, total cholesterol, low-density lipoprotein, high-density lipoprotein, and triglycerides were added to the 2005 Medical Evidence form. Blood urea nitrogen (BUN) was dropped from the 2005 form, therefore, BUN data are not shown in Table C.1. Estimated glomerular filtration rate (eGFR) was calculated from the serum creatinine measurement on CMS 2728, using the Chronic Kidney Disease-Epidemiology Collaboration (CKD-EPI) creatinine-based equation without a term for Black race (Inker et al., 2021) for patients aged 18 years or older and the Bedside Schwartz equation (Schwartz et al., 2009) for patients aged younger than 18 years.

Table C.2 shows patients' prior and current employment status (item 16 on CMS 2728) for 2014-2016 (C.2), 2017-2019(C.2(2)), and 2020-2022 (C.2(3)).

Employment status is collected at the time the form is filled out and for six months prior. There are eight employment categories for both current and prior employment status, and only one category should be

selected for each. If the patient is under 6 years old, the employment status questions should be left blank according to form instructions. For patients under 14, we leave six employment statuses blank (employed full time, employed part time, homemaker, retired due to age/preference, retired (disability), and medical leave of absence). Only student category is shown for patients under 14.

Table C.3 shows patient medical insurance coverage (items 11 and 12 on CMS 2728) for 2014-2016 (C.3), 2017-2019 (C.3(2)) and 2020-2022 (C.3(3)). There are seven categories of insurance coverage for item 12: Medicare, Medicaid, Employer Group Health Insurance, Department of Veterans Affairs (DVA), Medicare Advantage, Other, and None. Item 11, "Is the patient applying for ESRD Medicare coverage?", allows an additional category to be added to insurance status.

Table C.4 presents patient comorbidity (item 17 on CMS 2728) for 2017-2019 (C.4) and 2020-2022 (C.4(2)). A single patient could have multiple comorbidities.

Table C.5 describes the frequency and duration of prescribed therapy for hemodialysis patients (item 23 on CMS 2728) for 2017-2019 (C.5) and 2020-2022 (C.5(2)).

Table C.6 presents whether patients on dialysis were informed about kidney transplant options (items 26 and 27 on CMS 2728) for 2017-2019 (C.6) and 2020-2022 (C.6(2)). Patients not informed of transplant options have additional information on the reason for not being informed (item 27). A single patient could have multiple reasons for not being informed. Due to revised data field of the reasons not being informed of transplant options in the 2018 revision of 2728 form, 'Unsuitable due to age' and 'Psychologically unfit' are combined into 'Other reason' for 2020-2022 incident patients with completed 2015 revision of 2728 form.

Tables C.7-C.10 describe care received prior to ESRD therapy (item 18 on CMS 2728) for 2018-2022. Table C.7 shows data for pre-ESRD nephrology care (item 18.b). Table C.8 shows data for pre-ESRD kidney dietician care (item 18.c). Table C.9 shows data for vascular access at initiation of renal replacement therapy (item 18.d). If arteriovenous (AV) fistula access was not used, whether a maturing AV fistula or graft is present was further assessed. Table C.10 shows data for erythropoiesis stimulating agent (ESA) use prior to ESRD therapy (item 18.a).

Table C.11 presents primary dialysis settings at initiation of renal replacement therapy (item 22 on CMS 2728) for 2017-2019 (C.11) and 2020-2022 (C.11(2)). The three primary dialysis settings are home, dialysis facility/center, and skilled nursing facility/long-term care facility.

### *REFERENCE TABLE D: TREATMENT MODALITIES*

Reference Table D is divided into four parts. The first, Tables D.1-D.11 and D.15-D.16, provides counts and percentages of incident and prevalent patients alive at the end of each year by demographics, geographic location, and treatment modality. Age is computed at the start of ESRD for incident patients and as of December 31 for point prevalent patients.

The second part, Table D.12, shows modality at day 90 and at two years after the date of first service for all incident patients for 2018-2020 combined. The 90-day rule is used to exclude patients who die during the first 90 days of ESRD, and age is computed as of the ESRD first service date.

The third part, Tables D.13-D.14, presents counts of prevalent patients alive at the end of 2022, by ESRD exposure time (vintage) and modality. Table D.13 shows counts by the number of years of ESRD, while Table D.14 presents counts by the number of years on the end-of-year treatment modality. For the

duration of ESRD exposure, zero should be read as less than one year, one year as at least one full year but less than two, and so on.

The fourth part, Tables D.17-D.24, presents counts of incident and prevalent patients alive at the end of selected years (2014, 2018, and 2022), by demographic characteristics, payer category, and treatment modality. Age is computed at the start of ESRD for incident patients and as of December 31 for point prevalent patients. The payer categories are:

- Medicare Fee for Service (Medicare as primary payer)
- Medicare/Medicaid (dually eligible)
- Medicare as secondary payer: with employer group health plan (EGHP) or not with EGHP
- Medicare Advantage or Medicare+Choice plans also called HMO (health maintenance organization)
- Other and unknown payers. A detailed discussion of payer categories can be found in the Database Definitions section of this chapter.

### *REFERENCE TABLE E: TRANSPLANTATION: PROCESS*

Reference Tables E.1-E.6 present data regarding the kidney transplant waiting list. Table E.1 presents counts of ESRD-certified candidates added to the waiting list for a kidney or kidney-pancreas transplant during the given year, by demographics, primary cause of ESRD, transplant number (first vs. subsequent transplant), active status, blood type, and panel reactive antibody (PRA) level. Patients listed at multiple transplant centers are counted only once.

Table E.2 presents waiting times, defined as the median time in days from first listing to transplant among patients listed for a kidney-alone transplant. Median waiting time is estimated with the Kaplan- Meier method. Patients listed at multiple centers are counted from the time of the first listing. The data are censored at loss to follow-up, death, or the end of the analysis period (which is 12/31/2022 for the 2024 Reference Tables).

Given that the median waiting time for most subgroups of patients is between three to five years, the value cannot be estimated reliably without at least five years of follow-up. As a result, the 2024 Table E.2 only shows data up to year 2017.

Table E.2 reports data by demographics, primary cause of ESRD, blood type, PRA level, and first or subsequent transplant. Table E.2.2 reports data by state/territory and Table E.2.3 reports data by renal network.

Table E.3 presents counts of ESRD-certified patients on the waiting list at any transplant center on December 31 of the given year, regardless of when the first listing occurred, by demographics, primary cause of ESRD, transplant number, blood type, PRA level, time on the list, and active status.

Table E.4 is the percent of dialysis patients that are on the kidney wait list by year. The denominator is the count of point prevalent dialysis patients on 12/31 of each year, and the numerator is the count of the point prevalent dialysis patients on the waiting list for a kidney on 12/31 of each year. Table E.4 reports this by demographics and primary cause of ESRD. E.4.2 reports it by state/territory and Table E.4.3 by renal network.

Table E.5 presents the percent of patients either on the waiting list or receiving a kidney transplant within one year of ESRD initiation, using the Kaplan-Meier method. Patients receiving a deceased-donor kidney transplant are included in Tables E.5, E.5.3, and E.5.4. Patients receiving a deceased or living-donor kidney transplant are included in Tables E.5.2, E.5.5, and E.5.6. Tables E.5 and E.5.2 report data by demographics and primary cause of ESRD, Tables E.5.3 and E.5.5 report data by state/territory, and Tables E.5.4 and E.5.6 report data by renal network. Note that residents of the 50 states, the District of Columbia, Puerto Rico, and U.S. territories (= Guam, Northern Marianas) are all included in these tables.

Table E.6 presents the percent of patient receiving a kidney-along transplant within one year of waitlisting, using the Kaplan-Meier method. Table E.6 reports data by demographics, primary cause of ESRD, blood type, PRA level, and first or subsequent transplant. Table E.6.2 reports data by state/territory and Table E.6.3 reports data by renal network.

Tables E.7-E.9 present renal transplant counts by various combinations of factors. All kidney transplants, including kidney-alone and kidney plus one or more other organs, are included, and all counts include non-Medicare patients. Table E.7 presents transplant counts by donor type. Table E.8 shows transplant counts for recipients whose age is younger than 18 years, by demographics, donor type, transplant number, and blood type.

Table E.9 illustrates the distribution of recipients by donor type. Each E.9 table subsets transplant counts by demographics, primary cause of ESRD, blood type, transplant number, and PRA level determined from the OPTN Recipient Histocompatibility worksheet/form, and shows a cross-tabulation of recipients and donors in terms of cytomegalovirus antibody status, hepatitis C antibody status, and Epstein-Barr virus antibody status at the time of transplantation. A recipient/donor is considered positive for any of these antibodies if any applicable OPTN data source indicates positive. Unknown status is applied when no applicable data fields indicate “positive” or “negative.”

Table E.9 reports data for all donor types. Table E.9.2 reports data for deceased donors. Cold ischemia time (in hours) is reported for deceased donor transplants only and is taken from the OPTN Transplant Recipient Registration worksheet/form. Table E.9.3 reports data for living donors, and donor relationship is reported for living donor transplants only.

Table E.10 presents transplant rates per 100 dialysis patient-years by donor type. Table E.10 reports data for all donor types. Table E.10.2 reports data for deceased donors and Table E.10.3 reports data for living donors. All HD patients, PD (CAPD/CCPD) patients, and patients on an unknown form of dialysis are included, as are all non-Medicare dialysis patients. A patient’s dialysis days at risk are counted from the beginning of the specified year or from day one of ESRD dialysis therapy if treatment begins within the specified year until transplant, death, or the end of the year, whichever comes first. Dialysis time for patients returning to dialysis from transplant is counted. Transplant rates are calculated as the number of transplants, including kidney-alone and kidney plus one or more other organs, divided by the total number of dialysis patient-years for each year.

### *REFERENCE TABLE F: TRANSPLANTATION: OUTCOMES*

Reference Table F: Transplantation: Outcomes presents probabilities of graft survival and graft failure necessitating dialysis or repeat transplantation by donor type, age (on the day of transplant), sex, race/ethnicity, primary cause of ESRD, and first vs. subsequent transplant. Data are presented for outcomes at 90 days, one year, two years, three years, five years, and ten years post-transplant. The

probabilities are expressed as percentages varying from 0 to 100 (rather than as probabilities varying from 0 to 1).

This section seeks to address two major issues: the probability of graft survival at various times post-transplant and the probability that a recipient will return to dialysis or require repeat transplantation at various times post-transplant. Recipients are followed from the transplant date to graft failure, death, or the end of the follow-up period (December 31, 2022). In the analysis of graft survival, death is considered a graft failure. In the analysis of graft failure necessitating dialysis or repeat transplantation, patients are followed until graft failure (excluding death), and patient follow-up is censored at death. To produce a standard patient cohort, patients with unknown age or sex are omitted. Unknown age is defined as a missing age at transplant or an age calculated to be less than zero. Transplant patients for whom the donor type is recorded as "other" or "unknown" are excluded.

Patients are also excluded if their ESRD first service date is prior to 1977. Residents of the 50 states, the District of Columbia, Puerto Rico, and the U.S. territories are included in these tables. "Other cause" in the primary cause of ESRD stratification includes patients with missing data, unknown cause, and causes other than diabetes, hypertension, and glomerulonephritis.

Unadjusted survival probabilities are estimated using the Kaplan-Meier method, while the Cox proportional hazards model is used for adjusted probabilities. Probabilities are adjusted for age, sex, race/ ethnicity, primary cause of ESRD, and first vs. subsequent transplant, and standardized to 2020 recipient characteristics. Adjusted survival probabilities presented by each of the covariates (age, sex, race/ ethnicity, primary cause of ESRD or first vs. subsequent transplant) are standardized to the distribution of the remaining five covariates using the 2020 ESRD cohort as the standard population. For example, survival by age is adjusted for sex, race/ ethnicity, primary cause of ESRD, and first vs. subsequent transplant.

### *REFERENCE TABLE G: HOSPITALIZATION*

Reference Table G presents adjusted total admission and hospital day rates, by year, 2012-2022. The model-based adjustment method was used (Liu et al., 2006).

Because hospitalization data for non-Medicare Primary Payer patients may be absent or incomplete, analyses in this section include only patients with Medicare as their primary payer. Hospitalization data are obtained from institutional inpatient claims. Hospitalization data in Reference Table G do not exclude inpatient stays for the purpose of rehabilitation therapy.

Reference Table G includes dialysis and transplant patients who are on their modality for at least 60 days, reaching day 91 of ESRD on January 1 of the year (January 1 point prevalent patients) or first met the 60 days and 91 days requirement any time in the year (incident patients), and residing in the 50 states, the District of Columbia, Puerto Rico, and the U.S. territories. Tables G.1–G.10 exclude records where the age or sex is unknown. Age is determined on January 1 of each year for point prevalent patients and day 91 for incident patients. Patients are also classified according to their primary cause of ESRD, in which the "other" category includes patients with missing data or causes other than diabetes, hypertension, or glomerulonephritis. Patients are classified by modality at the beginning of the year (point prevalent patients) or on day 91 (incident patients) with the 60 days rule:

- All dialysis: patients on HD, CAPD/CCPD, or dialysis of an unknown type, as well as those on more than one dialysis modality in the past 60 days

- Hemodialysis
- CAPD/CCPD
- Transplant: patients with a functioning transplant received less than three years
- All-ESRD: all patients

Patients who do not have Medicare coverage, have Medicare as a secondary payer or have Medicare Advantage coverage will have incomplete or no hospitalization data in the claims files. For that reason, cohorts for these tables include only patients with fee-for service Medicare Parts A and B coverage at the start of follow-up. The follow-up period is censored when a patient's payer status changes to no longer having fee-for-service Medicare Parts A and B coverage or Medicare as a primary payer.

For patients in the all dialysis, HD, and CAPD/CCPD categories, the period at risk for all hospitalization analyses is from January 1 or day 91 of ESRD until the earliest of death, three days prior to transplant, end of Medicare Parts A and B coverage, or December 31. Modality change is considered a censoring event only in the case of a change from dialysis to transplant.

For dialysis patients in the all ESRD category, in contrast, the analysis period is censored only at death, end of Medicare Parts A and B coverage, or December 31 of the given year, a modality change is not used as a censoring event.

For transplant patients in the all-ESRD and transplant categories, the period is censored at the earliest of death, three years after the transplant date, end of Medicare Parts A and B coverage, or December 31 of the given year. Censoring of transplant patients at three years following the transplant is necessary because Medicare eligibility may be lost, and hospitalization data may be incomplete for these patients.

Time at risk is calculated differently for hospital days and total admissions. Since a hospitalized patient remains at risk for additional hospital days, rates for hospital days include hospital days in the time at risk value. Since a currently hospitalized patient is not, however, at risk for a new admission, hospital days for each year are subtracted from the time at risk for total admissions.

All admissions and hospital days during the analysis period are included, respectively, in the total admissions and hospital days for each year. An admission for a hospitalization that occurs before and spans the start of the analysis period is excluded from the total admissions for that period, and only the hospitalization days within the period are counted in the total days for hospital day rates. The minimum length of stay is one day, and hospitalizations with an admission and discharge on the same day and those with a discharge the day after admission are both counted as one day.

As in previous ADRs, all overlapping and only certain adjacent hospitalizations are combined, due to the fact that many adjacent claims may actually be legitimate separate hospitalizations. Specifically, hospitalizations with an admission on the same day or the day after a previous discharge are combined only when there is a discharge transfer code or indication of an interim claim. In the case of two hospitalizations combined into one, the principal diagnosis and procedure codes are retained from the first of the two hospitalizations, with the combined hospitalization extending from the first admission date to the last discharge date.

The methods for computing adjusted total admission and hospital day rates use the model-based adjustment method (Liu et al., 2006). Predicted rates for each subgroup combination of age, sex, race/ethnicity, primary cause of ESRD, patient vintage, dual eligibility and year are obtained using a model with the Poisson distribution. For prevalent patient cohorts, this model uses data from the current

and previous two years, with respective weights of 1, one-fourth, and one- eighth. Adjusted rates are then calculated using the direct adjustment method with all 2015 ESRD patients as the reference cohort.

Tables G.11-G.15 show inpatient utilization in period prevalent ESRD patients. Methods — including modality definitions, inclusion criteria, data cleaning, follow-up time definitions, and rate calculations — generally follow those described for the total admission rates in Tables G.1-G.5. Rates are unadjusted and reflect total admissions per 100 patient-years for 2014-2016, 2017-2019, and 2020-2022 (pooled) prevalent patients. While the rates for "All causes" are computed similarly to the unadjusted rates in G.1-G.5, the other nine cause-specific categories only include admissions for specific diseases. "Dialysis access" contains both vascular access and PD access hospitalizations that are classified as "pure" inpatient vascular/dialysis access events. Such access events are defined as admissions with a specified ICD-9-CM or ICD-10-CM principal diagnosis code or an ICD-9-CM or ICD-10-CM principal procedure code in conjunction with a certain diagnosis-related group (DRG) code. Codes for vascular access hospitalizations are listed in Table RG.1. If an admission does not qualify as vascular/dialysis access, it is classified by the principal diagnosis code into one of eight other mutually exclusive groups shown in Table RG.2.

**Table RG.1 DRG and ICD-9-CM procedure and diagnosis codes for vascular access and peritoneal dialysis access hospitalizations**

| DRG codes: prior to October 1, 2007 | DRG codes: after September 30, 2007 |
|---|---|
| 112 Percutaneous cardiovascular procedure | 252 Other vascular procedures with Major complicating conditions (MCC) |
| 120 Other circulatory system OR procedure | 264 Other circulatory system OR procedures |
| 315 Other kidney and urinary tract OR procedure | 673 Other kidney & urinary tract procedures with MCC |
| 442 Other OR procedure for injuries with complication | 674 Other kidney & urinary tract procedures with CC |
| 443 Other OR procedure for injuries without complication | 675 Other kidney & urinary tract procedures without CC/MCC |
| 478 Other vascular procedure with complication | 907 Other OR procedures for injuries with MCC |
| 479 Other vascular procedure without complication | 908 Other OR procedures for injuries with CC |
| | 909 Other OR procedures for injuries without CC/MCC |
| **ICD-9-CM procedure codes** | **ICD-10-CM procedure codes** |
| 38.95 Venous catheterization for renal dialysis<br>39.27 Arteriovenostomy for renal dialysis<br>39.42 Revision of arteriovenous shunt for renal dialysis<br>39.43 Removal of arteriovenous shunt for renal dialysis<br>39.93 Placement of vessel-to-vessel cannula<br>39.94 Replacement of vessel-to-vessel cannula<br>86.07 Placement of totally implantable vascular access device | 031n0xD, 031n0xF for n=2-8 and x=9, A, J, K, Z; 031n0xF for n=9, A-C and x=9, A, J, K; 03PYx7Z, 03PYxJZ, 03PYxKZ for x=0, 3, 4; 03WY0JZ; 03WY3JZ; 03WY4JZ; 03WYXJZ; 05HY33Z; 06HY33Z; 0JH83XZ; 0JHD0WZ; 0JHD0XZ; 0JHD3WZ; 0JHD3XZ; 0JHF0WZ; 0JHF0XZ; 0JHF3WZ; 0JHF3XZ; 0JHL0WZ; 0JHL0XZ; 0JHL3WZ; 0JHL3XZ; 0JHM0WZ; 0JHM0XZ; 0JHM3WZ; 0JHM3XZ |
| **ICD-9-CM diagnosis codes** | **ICD-10-CM diagnosis codes** |
| 996.1 Mechanical complication of vascular device, implant, graft<br>996.56 Mechanical complication due to peritoneal dialysis catheter<br>996.62 Infectious complication of vascular device, implant, graft<br>996.68 Infectious complication due to peritoneal dialysis catheter<br>996.73 Other complication due to renal dialysis device, implant, graft<br>999.31 Infection due to central venous catheter<br>V56.1 Fitting and adjustment of extracorporeal dialysis catheter<br>V56.2 Fitting and adjustment of peritoneal dialysis catheter | T80.218A; T80.219A; T82.310A-T82.531A; T82.511A; T82.513A-T82.518A; T82.520A; T82.521A; T82.523A-T82.531A; T82.533A-T82.538A; T82.590A; T82.591A; T82.593A-T82.598A; T82.7XXA; T82.818A; T82.828A; T82.838A; T82.848A; T82.858A; T82.868A; T82.898A; T85.611A; T85.621A; T85.631A; T85.691A; T85.71XA; Z49.01; Z49.02 |

**Table RG.2 Diagnosis codes used to define cause of hospitalization**

| Cause of hospitalization | ICD-9-CM diagnosis codes | ICD-10-CM diagnosis codes |
|---|---|---|
| Circulatory | 390-459 | A18.83; E08.51; E08.52; E09.51; E09.52; E10.51; E10.52; E11.51; E11.52; E13.51; E13.52; G45.0-G45.2; G45.4-G46.8; I00-I67.2; I67.4-I6.782; I67.841-I87.9; I89.0-I95.9; I97.0-I97.2; I99.8; I99.9; K64.0-K64.9; M30.0- M31.9; M32.11; M32.12; N26.2; R00.1; R58; T80.0XXA; T81.1718A; T81.73XA; T82.817A; T82.818A |
| Digestive | 520-579 | A69.0; B25.1; B25.2; E08.43; E08.630; E08.638; E09.43; E09.630; E09.638; E10.43; E10.630; E11.43; E11.630; E13.43; E13.630; J86.0; K00.0-K31.6; K31.811-K63.4; K63.81-K63.9; K65.0-K67; K68.12-K904; K90.89-K91.2; K91.5; K91.850; K91.858; K91.89-K95.89; M26.00-M27.9; N99.4; R11.10; R11.13; R18.8; R68.2 |
| Genitourinary | 580-629 | A18.14; A56.01; A56.02; A56.11; B52.0; E08.21-E08.29; E09.21-E09.29; E23.0; M32.14; M32.15; M35.04; N00.0-N22; N25.0-N39.3; N39.8-N97.9; N99.110-N99.3; N99.510-N99.518; N99.518; R10.2; R31.0-R31.9; R36.1; R80.2; R83.711A; R83.721A |
| Endocrine and metabolic | 240-279 | C88.0; C96.5; C96.6; D47.2; D80.0-D849; D89.0-D89.9; E00.0-E03.4; E03.8-E07.1; E07.89-E35; E40-E74.9; E75.21; E75.22; E75.240-E75.249; E75.3; E75.5-E78.70; E78.79-E78.9; E79.1-E83.19; E83.30-E89.6; H49.811- H49.819; M10.00-M10.9; M1A.00X0-M1A.09X0; M1A.20X0-M1A.9XX1; M35.9; M83.0-M83.9; N20.0; N98.1 |
| Respiratory | 460-519 | A22.1; A37.01; A37.11; A37.81; A37.91; B25.0; B44.0; B44.81; B77.81; D57.01; D57.211; D57.411; D57.811; J00-J01.91; J02.8; J02.8; J02.9; J03.80-J95.3; J95.811-J95.822; J95.84; J96.00-J99; M32.13; M33.01; M33.11; M33.21; M33.91; M34.81; M35.02; R09.1; R09.81 |
| Infectious | 001-139 | A00.0-A329; A35-A48.0; A48.2-B44.7; B44.89-B78.0; B78.7-B99.9; D86.0- D86.9; G02; G14; H32; I32; I39; I67.3; J02.0; J03.00; J03.01; J17; J20.0- J20.7; K90.81; L08.1; L44.4; L94.6; M00.00-M00.89; M02.30-M02.39; M60.009; N34.1; R11.11 |
| Cancer | 140-234 | C00.0-C43.9; C45.0-C75.9; C76.0-D03.9; D05.00-D09.9 |
| Other | codes not listed above | codes not listed above |

Tables G.1.1-G.5.1 present adjusted rates similar to those shown in G.1-G.5, but include more patient subgroups. Additionally, Tables G.1.2-G.5.2 display the counts of the total admissions, patient-years at risk, and total patients that are used to calculate the total admission rates.

## *REFERENCE TABLE H: MORTALITY*

Cohorts for Reference Table H include both Medicare and non-Medicare patients living in the 50 states, the District of Columbia, Puerto Rico, and the U.S. territories. Reference Table H does not apply the 60-day stable modality rule and 90-day rule.

The cohorts in Tables H.1-H.12 are comprised of period prevalent patients, including those alive on January 1 and those incident during the calendar year. All patients are followed from either January 1 (for prevalent patients) or from the date of onset of ESRD (for incident patients). Follow-up is censored at loss to follow-up, date of transplant (for dialysis patients), 90 days after recovery of function, or December 31 of the year. Age is defined at the beginning of follow-up. In calculating adjusted mortality, we have adjusted for and reported eight race & ethnicity groups (Non-Hispanic white, Non-Hispanic Black/African American, Hispanic, Asian, Native American, Native Hawaiian and Pacific Islander, Other or multiracial, and Unknown). A small number of patients missing sex were excluded (0.01%).

Tables H.1, H.2, and H.2_1 present mortality data for all ESRD patients. Total deaths are presented in Table H.1. Overall unadjusted (H.2_unadj) and adjusted (H.2_adj) annual mortality rates by age, sex, race/ethnicity, primary cause of ESRD, and years of ESRD treatment (vintage) are presented in Table H.2. Category-specific unadjusted mortality rates are calculated as total patient deaths divided by total follow-up time. Adjusted rates are computed by an appropriately weighted average of predicted category-specific rates (Liu et al., 2006), with the predicted rates based on generalized linear models.

Overall mortality rates are adjusted for age, sex, race/ethnicity, primary cause of ESRD, and years of ESRD treatment, while rates for each individual category are adjusted for the other five factors. The reference population is the 2020 prevalent ESRD cohort. Table H.2_1 presents unadjusted mortality rates by age, sex, race/ ethnicity, within primary cause of ESRD categories for 2022 prevalent ESRD patients, rates are again based on a generalized linear model.

The same methods are used for Tables H.3, H.4_unadj, H.4_adj, and H.4_1 (dialysis), H.5_unadj and H5_adj (dialysis patients never on the transplant waiting list), H.6_unadj and H.6_adj (dialysis patients on the transplant waiting list), H.7_unadj and H7_adj (dialysis patients returned to dialysis from transplant), H.8_unadj, H.8_adj, and H.8_1 (HD), H.9_unadj, H.9_adj and H.9_1 (CAPD/CCPD), and H.10_unadj, H.10_adj and H.10_1 (transplant).

For lifetime tables of prevalent patients (H.13_Dial, H.13_Tx, H.13_Dial_DM, H.13_Tx_DM, H.13_Dial_NDM, H.13_Tx_NDM), we used method from the National Vital Statistics Report (NVSR) based on the USRDS ESRD data. Mortality rates were estimated using patient level data and then aggregated by age group, sex, race/ethnicity. We then calculated average remaining lifetime. The expected remaining lifetime reported for a five-year age range is the mean of the values in the rage. For example, the value reported for the 30-34 years old age group is the average of the values for age 30, 31, 32, 33, and 34. Similarly, the life expectancy of the 85+ age group is the mean of the values for ages 85-100.

## *REFERENCE TABLE I: PATIENT SURVIVAL*

Reference Table I presents patient survival probabilities, based on incident cohorts. All causes of death are included, as are all non-Medicare patients and patients living in the 50 states, the District of Columbia, Puerto Rico, and the U.S. territories.

Patients are excluded if sex or age is unknown. All new ESRD patients with an ESRD first service date between January 1, 2002 and December 31, 2022, are included in the analysis. These patients are followed from day one (ESRD onset) until death, loss to follow-up, or December 31, 2022. For dialysis patients, both HD and CAPD/CCPD, follow-up is also censored at recovery of native renal function and at receipt of a kidney transplant. Unadjusted patient survival probabilities are estimated using the Kaplan-Meier method, while adjusted survival is computed through model-based direct standardization (Liu et al., 2006) using Cox regression. Incident 2020 ESRD patients served as the reference population for both overall and subgroup-specific adjusted survival.

### *REFERENCE TABLE J: PROVIDER CHARACTERISTICS*

For Reference Table J, data are obtained from the CMS ESRD Facility Survey (CMS 2744, 2000 to the present), the Dialysis Facility Compare (DFC) database (2001-2011), and the CDC National Surveillance of Dialysis-Associated Diseases in the United States (2001-2002). The CDC discontinued the National Surveillance of Dialysis- Associated Diseases after 2002. Facilities switched from submitting form CMS 2744 via the ESRD Networks to submitting via CROWNWeb in 2012. This new method of input and submission may lead to unanticipated changes in trends beginning in 2012.

A facility's hospital-based or freestanding status is determined from facility type (variable name "org_fac_type_name") in the survey form. A facility's profit status is determined through the ownership type field on the ESRD Facility Survey (2012-2022).

Residents of the 50 states, the District of Columbia, Puerto Rico and the U.S. territories are all included in these tables.

Table J.1 shows counts of the facilities by year for 2002 through 2022 by type of facility. The number of patients in these facilities is also shown. These facilities are the source for all tables reported in this section. Tables J.2-J.11 present data from fields in form CMS 2744.

### *REFERENCE TABLE K: HEALTHCARE EXPENDITURES FOR ESRD*

In addition to report healthcare expenditures for overall ESRD patients (**ESRD_Ref_K_Costs_2024_All**), new in 2024 ADR, we also report healthcare expenditures for ESRD patients with dual eligible for Medicare/Medicaid (**ESRD_Ref_K_Costs_2024_DualEligible**) and with Medicare only (**ESRD_Ref_K_Costs_2024_MedicareOnly**), respectively. Also new in 2024 ADR, we update the DRG codes using MS-DRG version 40 to replace previous versions. As a result, (1) we replace 44 DRG codes as "Not assigned" with new assigned definitions which are embodied in Tables K.1, K.3, and K.4; (2) we update inpatient cost categories with new DRG codes which are embodied in Tables K.1 and K.4.

Cost information in this section is derived from the ESRD Medicare inpatient, outpatient, skilled nursing facility, hospice, home health, physician/supplier, durable medical equipment, and Part D claims data. Our claims databases are created annually six months after the end of each calendar year and are downloaded directly from CMS. There are no subcategories excluded. Cross-year claims are claims that start in one calendar year and end in the following year and are included only in the following year's costs. For example, a claim that starts in December of Year 1 and ends in January of Year 2 will be

counted in Year 2. Cross-payer claims are considered to be associated with the payer status that exists at the start of the claim. For example, a patient that is Medicare Primary when the claim starts and not Primary when the claim ends is categorized as Medicare Primary for that claim.

Note that originally, the distinction between ESRD and pre-ESRD claims was made by the claim start date, and only claims that started on or after the ESRD first service date were considered ESRD claims. Starting with the 2016 ADR, the pre-ESRD vs. ESRD distinction is made using the claim end date instead, thereby including claims that overlapped with the first service date as ESRD claims.

For K.1 and K.2, a small number of pre-ESRD records are included in cases where a patient had a transplant within 30 days of their first service date. Claims are collected for 30 days prior to the transplant date to include any claims associated with the transplant. Claims data are obtained for all patient identification numbers in the USRDS Database. Each type of claim is processed separately, with their data collapsed into the detailed service type categories that are shown in K.1, K.4, K.a, K.b, and K.b.1-54.

In tables that report on a specific modality, note that only claim records whose start and end dates fall within the patient's modality and payer start and end dates are included in the cost analysis.

PAYER FILE

The payer history file is similar in concept to the USRDS treatment history file (RXHIST). Payer status is tracked for each ESRD patient from the ESRD first service date until death or the end of the study period. Data from the Medicare Enrollment Database and dialysis claims information are used to categorize payer status as Medicare Primary payer (MPP), Medicare Secondary payer (MSP), or non-Medicare. The claims database contains data only for MPP and MSP patients, so expenditure calculations analyses are restricted to these categories. In addition, as it is impossible to determine the complete cost of care for ESRD patients with MSP coverage, analyses of costs per person per year (PPPY) exclude patients when they have this MSP coverage.

PAYMENT INFORMATION

The expenditure calculations for this section focus on the claim payment amount, which is the amount of the payment made from the Medicare trust fund for the services covered by the claim record. These analyses also include the pass-through per diem amount, which applies to inpatient claims and reimburses the provider for capital-related costs, direct medical education costs, and an estimate of organ acquisition costs ($25,000 in 2018).

MODEL 1: AS-TREATED ACTUARIAL MODEL

Model 1 and Model 2 differ by how modality is treated. In Model 1, an as-treated model, patients are first classified by their modality at entry into the analysis and retain that classification until a modality change. When a change is encountered in the data, the initial modality is censored, and a new observation with the new modality is created. Under this method, aggregation of Medicare payments is done on an as treated basis, attributing all payments for a particular claim to the patient’s modality at the time of the claim. Tables K.5-9, K.a, K.b, and K.b.1-54 are all MPP only and Model 1 modality. Model 1 modality is derived from the patient treatment history and is one of:

- Hemodialysis (HD)
- CAPD/CCPD (peritoneal dialysis)
- Other

- Transplant
- Unknown

The category "Other" includes cases in which the dialysis modality is not HD, CAPD, or CCPD, while the transplant category includes patients who have a functioning graft at the start of the period, or who receive a transplant during the period.

MODEL 2: CATEGORICAL CALENDAR YEAR MODEL

This model, described in the Health Care Financing Administration (now CMS) research report on ESRD (1993-1995), is used for Reference Tables K.10-K.13. With this method, patients are classified into four mutually exclusive treatment groups:

- Dialysis: ESRD patients who are on dialysis for the entire calendar year or for that part of the year in which they are alive and have ESRD
- Transplant: ESRD patients receiving a kidney transplant during the calendar year
- Functioning graft: ESRD patients with a functioning graft for the entire calendar year or for that part of the year in which they are alive and have ESRD
- Graft failure: ESRD patients who have had a transplant, but return to dialysis due to loss of graft function during the calendar year, patients with a graft failure and a transplant in the same calendar year are classified in the transplant category

OUTPATIENT BUNDLING

In 2011, CMS implemented a new payment system for dialysis, adding a set of dialysis-related drugs, laboratory tests and supplies to the dialysis payment bundle. Prior to 2011, outpatient spending for these services was reported on claim detail lines. Beginning in 2011, total spending appears on one detail line while other related details are zero (with the exception of dialysis facilities who elected to transition to the new payment system over a four year period, for which partial spending amounts for the newly bundled services still appear on individual claim lines).

TIME AT RISK

Time at risk is the time in which the patients are contributing claims to the cost aggregation. For this to happen, they must be alive, an ESRD patient, and have MPP status. For tables by modality, the aggregation begins at the start day of the modality. More specifically, time at risk is calculated by taking the latest date from (1) the first of the year, (2) the first service date, (3) the start of modality, or (4) the start of MPP, as the start date of the time at risk. The end date of the time at risk is considered the earliest of (1) the end of the year, (2) the date of death, (3) the end of modality, or (4) the end of MPP status. Claims are only counted in the total expenditure calculations if they occur within the patient’s time at risk.

Previously, USRDS has reported PPPY healthcare expenditures from all claim sources for ESRD patients with Medicare Parts A and B coverage. These tables are based on ESRD patients with Medicare as primary payer. Beginning with 2021 ADR, we added the following tables to report PPPY spending for subgroups, i.e., ESRD patients with Medicare Parts A, B, and D coverage: K.5.1, K.6.1, K.7.1, K.8.1, K.9.1, K.10.1, K.11.1, K.12.1, K.13.1, K.a.1, and K.b.1s. In addition, in Tables K.1, K.4, K.a, K.a.1, K.b, and K.b.1s we added Part D expenditures by drug categories.

## *REFERENCE TABLE L: VASCULAR ACCESS*

Within Reference Table L, Tables L.1-L.6 include period prevalent HD patients with Medicare as primary payer during the years 2003 to 2022. Vascular access placements are identified from inpatient, outpatient, and physician/supplier Medicare claims. Rates represent the total number of events divided by the total time at risk and are converted from days to patient-years.

Time at risk is defined as the time between the first day of a given year and the end of follow-up in the given year. Follow-up is censored at death, change in modality, change in payer status, or the end of the prevalent year.

Tables L.7-L.8 include point prevalent PD patients with Medicare as primary payer in 2022. Complications are obtained from inpatient Medicare claims during the time at risk in the prevalent year. Table L.7 shows the count of PD patients who experienced a complication in the prevalent year. Table L.8 shows the percentages of PD patients who had at least one event in the given complication category (sepsis, peritonitis, PD catheter infection) in the prevalent year. Follow-up on these patients is censored at death, change in modality, change in payer status, a claim for HD vascular access placement, or the end of the prevalent year.

Tables L.9-L.12 use EQRS/CROWNWeb clinical data to determine vascular access use among patients dialyzing on December 31 of the reported year. Catheter use includes any catheter, whereas AV fistula and AV graft use excludes the use of a central venous catheter.

See Table RL.1 for HCPCS, and ICD-9 /10 diagnosis, and procedure codes used for identifying access placements and complications.

## *REFERENCE TABLE M: CENSUS POPULATIONS*

Reference Table M.1 includes the U.S. resident population on July 1 by year, age, sex and race for years 2002-2022. The data is obtained from the U.S. Census Bureau and is a combination of intercensal data (2000-2010) and postcensal data (2011-2022). See the Analytical Method section in ESRD volume for details. The U.S. population in 2020 was used as the reference population for incident and prevalent calculation that is adjusted for age, sex, and race or ethnicity in ADR chapters or other Reference Tables. The rates per million population are calculated based on the population of the corresponding year.

## *REFERENCE TABLE N: INTERNATIONAL COMPARISONS*

Note that data collection methods vary considerably across countries, and direct comparisons should be made with caution.

See Data Collection in the section on **Chapter 11: International Comparisons** for how the data were obtained.

Prevalence was reported for all patients at the end of the calendar year (December 31), except where otherwise noted. The percent changes in Tables N.1.b, N.2, N.4.b, N.6.b, N.8.b, and N.9.b are defined as the percent difference between the average in 2021 and 2022 and the average in 2012 and 2013, which are used to reflect trends in incidence, prevalence, and transplantation rates over time. To be included in this calculation, countries or region needed to have reported relevant data for 10 years overall, for at least one

of the first two years (2012 and 2013), and for one of the last two years (2021 and 2022). The estimates of the average yearly change from 2012-2022 in these tables were determined from a univariate linear regression model, using year as the only independent variable. Though linear regression assumes a linear trend in the outcome of interest over time (year-by-year), results should be interpreted with caution, as the true country or region level data do not always adhere to this assumption. To be included in linear regression models, country or region needed to have reported relevant data for either 2012 or 2013, at least five of the years from 2014-2020, and for either 2021 or 2022.

Tables N.1-N.3 present the incident counts and incidence of ESRD patients in different countries or region. Incidence was calculated as the count of patients who started any form of renal replacement therapy during the year divided by the total population for that year, then multiplied by one million. Table N.1.a and N.1.b show the trends in the incident counts and incidence rates of treated ESRD patients, 2012-2022. Table N.2 shows the trends in the incidence of treated ESRD patients due to diabetes, 2012-2022. N.1.a and N.1.b use total incident patient count, while the count for N.2 is a subset of total incident patients whose kidney failure was due to diabetic nephropathy. Tables N.3.a and N.3.b show the 2022 incident counts and incidence rates of treated ESRD by five age groups, 0-19, 20-44 45-64, 65-74, and 75+. Age-specific incidence was calculated as the count in each age category divided by the total population in the respective category, multiplied by one million.

Tables N.4-N.5 present the prevalent counts and prevalence of ESRD in different countries or region, 2012-2022. Prevalence was calculated as the point prevalent count divided by the total population for that year, multiplied by one million. Table N.4.a shows the prevalent ESRD patient counts. Table N.4.b shows the trends in unadjusted prevalence of ESRD patients. Tables N.5.a and N.5.b present the 2022 ESRD prevalent counts and prevalence in different countries or region, by five age groups, 0-19, 20-44, 45-64, 65-74, and 75+.

Tables N.6-N.7 present the prevalence counts and prevalence of patients treated with dialysis therapy for ESRD, 2012-2022. Tables N.6.a and N.6.b show the trends in the prevalent counts and unadjusted prevalence of patients receiving dialysis. Tables N.7.a-N.7.f show the distribution of different modality use in prevalent dialysis patients, including counts and percentage of in-center hemodialysis (N.7.a, N.7.d), counts and percentage of CAPD/APD/IPD (N.7.b, N.7.e), and counts and percentage of home hemodialysis (N.7.c, N.7.f). The denominator was calculated as the sum of patients receiving HD, PD, or home HD, excluding patients with other/unknown modality.

Tables N.8-N.9 present data regarding kidney transplantation in different countries or region, 2012-2022. Tables N.8.a and N.8.b present the counts and unadjusted kidney transplantation rate for each country. The kidney transplantation rate is defined as the total number of kidney transplants (sum of deceased, living donor, and unknown donor) divided by the total population for that year, multiplied by one million. Tables N.9.a and N.9.b show the trends in the prevalent counts and unadjusted prevalence of treated ESRD patients with a functioning kidney transplant. Table N.9.c shows the percent of treated ESRD patients living with a functioning kidney transplant. The denominator is the prevalent number of patients receiving renal replacement therapy.

### *REFERENCE TABLE O: DRUG UTILIZATION*

References Tables O.1–O.2 present the top drugs classes used in 2022 among fee-for-service Medicare beneficiaries with ESRD, separately by treatment modality (HD, PD, and kidney transplant). These results are an expansion of the results presented in Volume 2, Chapter 10: Prescription Drug Coverage in

Patients with CKD (i.e., whereas the Chapter 10 results present the top 15 drug classes, these tables present the top 50 drug classes). These tables include period prevalent Medicare beneficiaries with ESRD, including point prevalent patients who were alive and enrolled in Medicare on January 1 of the reported year, with ESRD onset at least 90 days earlier, and incident patients who were alive and enrolled in Medicare 90 days after ESRD onset from January 1, 2022 and through December 31, 2022. Treatment modality is defined on January 1 for point prevalent patients and on day 90 after ESRD onset for incident patients. Analyses are limited to fee-for-service beneficiaries who were 18 years or older, resided in the 50 states, the District of Columbia, or the U.S. territories, and were enrolled in Medicare Parts A, B, and D at cohort entry.

Prescription drug claims occurring during follow-up in 2022 among fee-for-service Medicare beneficiaries with ESKD were matched to a therapeutic class according to the Medi-Span Generic Product Identifier (GPI) classification system. The National Drug Code (NDC) numbers used to identify each drug class are shown in the Excel file (**Codes for Prescription Drug Classes.xlsx**) that is located in the Analytical Methods for Volume 2. Drug classes were ranked two ways: by the percentage of beneficiaries who filled at least one prescription for a given class, and by the total insurance spending for a given class. The top 50 drug classes for each ranking method are shown in Reference Tables O.1 and O.2. In addition to showing total spending for each of the 50 drug classes, Table O.2 also shows spending per enrollee and per drug class user, as well as the percentage receiving each drug class. The total spending for all covered medications is also shown at the bottom of Table O.2. The per enrollee and per drug class user spending values can be used to differentiate costly drug classes in terms of being inexpensive drugs used by a large number of enrollees (e.g., antibiotics) versus very expensive drugs used by a minority of enrollees (e.g., antiretrovirals).

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