



ACUMEN

**End Stage Renal Disease
Prospective Payment System
Technical Expert Panel
Summary Report**

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Acumen, LLC
500 Airport Blvd., Suite 100
Burlingame, CA 94010

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GLOSSARY OF ACRONYMS

| | |
|----------|--|
| ADI | Area Deprivation Index |
| BMI | body mass index |
| BR | base rate |
| BSA | body surface area |
| CBSA | Core-Based Statistical Area |
| CHF | congestive heart failure |
| CKD | chronic kidney disease |
| CME | Common Medicare Environment |
| CMS | Centers for Medicare & Medicaid Services |
| CR | composite rate |
| EDB | Enrollment Database |
| ER | emergency room |
| ESA | erythropoietin-stimulating agent |
| ESRD PPS | End Stage Renal Disease Prospective Payment System |
| ETC | ESRD Treatment Choices Model |
| FFS | Medicare Fee for Service |
| FSB | formerly separately billable |
| GI | gastrointestinal |
| KCC | Kidney Care Choices Model |
| LGBTQ | lesbian, gay, bisexual, transgender, queer |
| LVPA | low-volume payment adjustment |
| MAP | Medicare Allowable Payment |
| NKF | National Kidney Foundation |
| NPRM | Notice of Proposed Rulemaking |
| OSRM | Open Source Routing Machine |
| QIP | ESRD Quality Incentive Program |
| RFI | Request for Information |
| RIC | Record Identification Code |
| RTI | Research Triangle Institute |
| SDOH | social determinants of health |
| TDAPA | Transitional Drug Add-on Payment Adjustment |
| TEP | Technical Expert Panel |
| TPNIES | Transitional Add-on Payment Adjustment for New and Innovative Equipment and Supplies |

INTRODUCTION

This report summarizes the proceedings of the fourth annual Technical Expert Panel (TEP) on the End Stage Renal Disease Prospective Payment System (ESRD PPS) convened by Acumen, LLC, in December 2021 at the contract request of the Centers for Medicare & Medicaid Services (CMS). The purpose of this panel was to begin discussion with stakeholders on health equity issues as they arise in the ESRD PPS. As such, it represents a departure from the first three TEPs in this series, which were focused on technical aspects of the redesign of the payment system. This report includes a summary of Acumen’s presentation to the panel on health disparities that can be measured using available Medicare data. It also includes feedback from the panelists on how well existing data capture health disparities and their suggestions for collecting information that captures disparities not detected from available data. Finally, the report discusses the panel’s consideration of how health disparities might be mitigated through additional refinements to the payment model.

The first TEP (December 2018) explored the components of the existing ESRD PPS, and presented alternative approaches with the goal of achieving a more refined case-mix adjusted payment system.¹ The second TEP (December 2019) elaborated on this theme, focusing on alternative approaches to measuring the cost of a dialysis session that would better reflect patient-level and treatment-level variations in cost. Other topics covered during the second TEP included the Transitional Drug Add-on Payment Adjustment (TDAPA) and the Transitional Add-on Payment Adjustment for New and Innovative Equipment and Supplies (TPNIES).² During the third TEP (December 2020), Acumen presented potential refinements to the payment model, including a suggested revision to the Low Volume Payment Adjustment, and suggested changes to the cost report. Subsequent to these TEPs, CMS published Requests for Information in its Notices of Proposed Rulemaking (NPRM) to seek broader stakeholder input on the suggested payment model refinements that were presented during the TEPs.³

The objective of the fourth TEP (December 2021) was to gather input from a broad spectrum of stakeholders on health disparities arising among vulnerable or historically underserved patient groups represented in the ESRD PPS. Acumen presented the results from

¹ <https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/ESRDpayment/Downloads/ESRD-PPS-TEP-Summary-Report-June-2019.pdf>.

² <https://www.cms.gov/files/document/end-stage-renal-disease-prospective-payment-system-technical-expert-panel-summary-report-december.pdf>.

³ <https://www.federalregister.gov/documents/2019/11/08/2019-24063/medicare-program-end-stage-renal-disease-prospective-payment-system-payment-for-renal-dialysis>;
<https://www.federalregister.gov/documents/2021/11/08/2021-23907/medicare-program-end-stage-renal-disease-prospective-payment-system-payment-for-renal-dialysis>;
<https://www.federalregister.gov/documents/2020/11/09/2020-24485/medicare-program-end-stage-renal-disease-prospective-payment-system-payment-for-renal-dialysis>

analyses of health disparities in the payment system that can be measured by currently collected data. Panelists responded with their interpretations of these results and provided their insights concerning other additional disparities not currently measured. Acumen also obtained ideas and suggestions for potential changes to data collection for the ESRD PPS to better measure and potentially reduce health disparities. In conjunction with the calendar year 2023 ESRD PPS NPRM, CMS will issue a Request for Information (RFI) on this topic to obtain input from a broader spectrum of stakeholders. Acumen will work with CMS to improve CMS's ability to detect and reduce health disparities in the ESRD PPS.

Achieving health equity is of the highest priority for CMS, as described in the January 2021 Executive Order⁴ that seeks to advance racial equity and support for underserved communities. While the overall goal of this project is to recommend to CMS options for a more accurate and statistically stable payment model for the ESRD PPS, Acumen will also continually assess the potential impacts on health equity of any changes to the payment system. This TEP was the first formal effort by Acumen to engage stakeholders in direct conversation about health disparities faced by Medicare beneficiaries with ESRD as they obtain dialysis treatment, how best to measure them, and to begin consideration of how to correct them.

This report begins with an introduction to the panel, a statement of objectives for this TEP, and a description of the structure of the sessions to follow. Section 2 of the report follows the order of the slide presentation given during the meeting. It begins with an overview of the mechanics of ESRD PPS and includes a description of the demographic characteristics of the ESRD PPS beneficiary population. Section 2 continues with subsections on three topical sessions addressing disparities in payment accuracy, treatment patterns, and health outcomes. Each of the subsections follows the same format: presentation of the findings from Acumen's technical analyses, followed by a summary of the subsequent panel discussion. Section 3 of the report provides a broad overview of the panel's discussion on key topics related to health equity that arose over the course of the day. The report was reviewed by and incorporates comments from the Panelists to ensure it accurately portrays the discussion held during the TEP. The report concludes with information on the next steps CMS is undertaking to understand and address health disparities in the ESRD PPS.

⁴ <https://www.Whitehouse.gov/briefing-room/presidential-actions/2021/01/20/executive-order-advancing-racial-equity-and-support-for-underserved-communities-through-the-federal-government/>

1 PANEL OVERVIEW

This section presents an overview of the 2021 ESRD PPS TEP. Section 1.1 describes the structure of the TEP. Section 1.2 describes the materials provided to panelists, and Section 1.3 lists the TEP panelists with their professional roles and organizational affiliations.

1.1 Structure

The TEP was convened remotely via videoconference on December 10, 2021. The TEP was organized into four topical sessions. The first session presented details of the ESRD PPS to ensure a common understanding and vocabulary amongst the panelists; the remaining three sessions presented the results of analyses on payment accuracy, dialysis treatment patterns, and health outcomes with a focus on beneficiary subpopulations at risk for health disparities. Panelists were invited to participate in discussion during each session. During the final session, both panelists and observers were invited to participate in an open-ended discussion about the issues discussed over the course of the day.

1.2 Materials

Prior to the TEP, Acumen provided panelists with the following materials: the agenda for the day; the slides and reports from the 2018-2020 TEPs; the 2021 TEP presentation slides; the TEP charter stating the goals and duties of the panel; a list of TEP members; and a webinar logistics document. The agenda is shown in Table 1.

Table 1. TEP Agenda

| Session | Topic |
|---------|--------------------------------------|
| 1 | Introductions and Goals for this TEP |
| 2 | Overview of the ESRD PPS |
| 3 | Payment Accuracy |
| 4 | Treatment Patterns |
| 5 | Health Outcomes |
| 6 | Open Discussion |

1.3 Members

The previous ESRD PPS TEPs included broad representation from stakeholder groups, including dialysis facilities and patient advocate organizations. For this TEP a special effort was made to recruit dialysis professionals and patient representatives who had direct experience with historically underserved patient populations. The resulting TEP included 16 panelists, comprising dialysis providers, nephrologists, patient advocates, and representatives of

professional associations and industry groups. The panelists, their roles, and their organizational affiliations are provided in Table 2 below.

Table 2. TEP Panelists

| Name | Professional Role | Organizational Affiliation |
|---------------------------|---|---|
| Eileen Brewer, MD | Medical Director, Renal Transplant Program | Texas Children’s Hospital |
| Lilia Cervantes, MD | Associate Professor of Medicine | University of Denver |
| Andrew Conkling | President, Board of Directors | Dialysis Patient Citizens |
| Deidra Crews, MD, ScM | Deputy Director | Johns Hopkins Center for Health Equity |
| Dawn Edwards | Patient Advisory Council, Patient Advocate, Wellness Ambassador | National Forum of ESRD Networks, Fresenius, Rogosin Institute |
| Derek Forfang | Kidney Patient Advocate and Public Policy Committee Chair | National Kidney Foundation |
| Sarraah Johnson, DNP, MBA | Chief, Diversity and Inclusion Officer, Senior Vice President of Operations | US Renal Care |
| Dugan Maddux, MD, PhD | Vice President, Kidney Disease Initiatives | Fresenius Medical Care |
| Lisa Maurer, LCSW | Corporate Social Worker | Dialysis Clinics, Inc. |
| Unini Odama, MD, MPH | Vice President, Medical Affairs | DaVita Kidney Care and Integrated Kidney Care |
| Jesse Roach, MD | Senior Medical Director | Health Equity, CVS Health |
| Sylvia E. Rosas, MD, MSCE | Chair, Associate Professor of Medicine | NKF Health Equity Advisory Committee, Harvard University |
| Rebecca Schmidt, DO | Clinical Nephrologist and Professor of Medicine | West Virginia University School of Medicine |
| Michael J.G. Somers, MD | Director, Clinical Services | Division of Nephrology, Boston Children’s Hospital |
| Curtis Warfield, MS | Patient Advocate, Senior Quality Analyst | NKF, State of Indiana |
| Julie A. Williams, BSA | Dialysis and Nephrology Administrator | Branson Nephrology & Dialysis |

2 SUMMARY OF TECHNICAL PRESENTATIONS

This section summarizes the technical presentations for each topical session of the TEP and the discussion that followed each presentation. The results described in Sections 2.1 through 2.4 are also provided in detail in the Appendix.

2.1 Overview of ESRD PPS

The purpose of this session was to provide a common framework for understanding the ESRD PPS, describe the various adjustments made by the system to address potential health disparities, and provide a profile of the ESRD PPS beneficiary population. The session topics included:

- Review of the ESRD PPS and adjustments to address health disparities
- Description of the metrics used to stratify the ESRD PPS patient population
- Demographic characteristics of the Medicare population receiving maintenance dialysis under the ESRD PPS

2.1.1 Summary of Presentation

Description of the ESRD PPS Patient Population

The ESRD PPS population included in these analyses was Medicare Fee-For-Service (FFS) beneficiaries receiving services paid for by the ESRD PPS in January 2020. Medicare beneficiaries enrolled in Part C (Medicare Advantage) with ESRD and receiving dialysis are not covered by the ESRD PPS and were not included in these analyses. The ESRD PPS population consists largely of patients who receive maintenance dialysis, but also includes a proportion of eligible beneficiaries of the ESRD PPS who are not on maintenance dialysis due to concurrent hospitalization or recent receipt of a kidney transplant. Those with functioning transplants were excluded from the analysis in order to focus on patients with claims from dialysis facilities.

Section 1881(b)(14) of the Social Security Act requires a bundled payment system for renal dialysis services. The ESRD PPS, which was established in 2011, bundles all essential renal dialysis services, including drugs, labs, supplies, and capital costs related to dialysis treatment. The bundle features a base rate that is required to include a payment adjustment based on case mix to account for patient comorbidities. The goal of this case-mix adjustment is to ensure that payment for treatment aligns with expected resource use for that treatment. The case-mix adjustment is intended to protect access to care for the least healthy and most costly beneficiaries by adequately compensating facilities treating a high proportion of these beneficiaries. Additionally, the ESRD PPS includes facility-level adjustments, also designed with the goal of aligning resource utilization with payment. These facility-level adjustments

account for additional costs that facilities incur as a result of their observed treatment volume, location, and proportion of high-cost treatments.

Dialysis treatment costs can be categorized into six discrete components or service types: capital expenditures, administrative costs, labor costs, and the costs for drugs, laboratory tests, and supplies. Capital costs include those associated with dialysis treatment equipment and other equipment directly related to the provision of dialysis treatment, such as water treatment equipment. Administrative costs include salaries and benefits for managerial, administrative, and clerical staff (e.g., accounting, legal services, patient scheduling, record keeping). Labor costs refer to the salaries and benefits for those providing direct patient care services. Drug costs are for drugs used to treat or manage a condition associated with an ESRD PPS functional category. Lab costs include the costs of routine laboratory tests for dialysis patients; supplies costs include the costs of supplies used to furnish direct dialysis care, such as tubes, syringes, and dialysate.

ESRD PPS payments include payments for composite rate (CR) and formerly separately billable (FSB) items and services, each of which is calculated differently. CR costs, which comprise roughly 90 percent of the costs associated with treatment, include elements from the six component costs. Because payments for these items and services are bundled, CR costs are not itemized on claims. Instead, aggregated CR costs are obtained from facility cost reports submitted annually by each facility. FSB items and services include selected drugs, labs, and supplies. These items and services are itemized on claims.

The case-mix adjustment model for the ESRD PPS uses two equations, one at the facility level and one at the patient level. The facility-level equation adjusts CR costs for selected facility characteristics, estimating the effect of case-mix factors on cost per treatment for bundled costs that are only available at the facility level. The patient-level equation adjusts costs for FSB items and services, roughly 10 percent of bundle expenses. It estimates the effect of select patient characteristics on FSB cost per treatment for each provider-beneficiary month. Patient-level case-mix factors include age categories, body surface area (BSA), low body mass index (BMI), onset status, and four comorbidities (pericarditis, gastrointestinal [GI] tract bleeding, hereditary hemolytic or sickle cell anemia, and myelodysplastic syndrome). Facility adjusters include low-volume status, rural status, and facility wage index. The final case-mix adjusters for adults are the weighted average of estimated coefficients from these two equations, where the weights are the fraction of costs attributed to CR costs (90 percent) vs FSB costs (10 percent). These equations were last calculated using 2012-2013 claims and cost report data, and became effective in January 2016.

The case-mix model described above is adapted for pediatric beneficiaries covered by the ESRD PPS, though there are several challenges in the statistical analysis of pediatric dialysis costs. First, the pediatric dialysis patient population is small. Second, costs associated with

pediatric dialysis are often aggregated with costs associated with adult dialysis, because they are reported together on facility cost reports. To address these challenges in estimating the pediatric case-mix adjusters, a more parsimonious case-mix model is used, which features patient-level adjusters limited to two age categories (younger than 13 years and 13-17 years) and two modalities (peritoneal dialysis and hemodialysis). This results in four payment tiers for the pediatric population.

Payments under the ESRD PPS for each treatment roughly break down into the following:

$$\text{Payment} = \text{Base Rate (BR)} * (\text{labor-related portion of BR} * \text{Wage Index} + \text{non-labor-related portion of BR}) * \text{Patient-Level Case-Mix Adjustment} * \text{Facility-Level Adjustment Factors (Low-Volume Adjustment \& Rural Adjustment)} + \text{Outlier Payment} + \text{Self-Dialysis Training Add-On} * \text{Wage Index} + \text{TDAPA} + \text{TPNIES}$$

where:

- Base Rate: reflects the average cost of all services in the bundle
- Patient-Level Case-Mix Adjustment: accounts for patient characteristics
- Wage Index: based on the hospital wage index
- Low-Volume Adjustment: 23.9 percent increase for low-volume facilities
- Rural Adjustment: 0.8 percent increase for rural facilities
- Outlier Payment: 80 percent of costs exceeding a specified threshold
- Self-Dialysis Training Add-On: payment for training for home dialysis
- TDAPA: Transitional Drug Add-on Payment
- TPNIES: Transitional Add-on Payment Adjustment for New and Innovative Equipment and Supplies

A Definition of Health Disparities

The White House's January 2021 Executive Order seeks to advance racial equity and support for underserved communities.⁵ In this executive order, equity is defined as the consistent and systematic fair, just, and impartial treatment of all individuals, including individuals who belong to underserved communities that have been denied such treatment, such as:

⁵ <https://www.Whitehouse.gov/briefing-room/presidential-actions/2021/01/20/executive-order-advancing-racial-equity-and-support-for-underserved-communities-through-the-federal-government/>.

- Black, Latino, Indigenous and Native American persons, Asian Americans, Pacific Islanders, and other persons of color
- Members of religious minorities
- Lesbian, gay, bisexual, transgender, and queer (LGBTQ+) persons
- Persons with disabilities
- Persons who live in rural areas
- Persons otherwise adversely affected by persistent poverty or inequality

Demographic Characteristics of the ESRD PPS Beneficiary Population

For the purposes of this TEP, patient-level data were stratified by the following factors in order to identify subpopulations for which health disparities may exist: sex, age, race/ethnicity, urban/rural residence, Medicare and Medicaid benefit status, original reason for Medicare entitlement, and Area Deprivation Index (ADI) of a beneficiary’s residence. Medicare and Medicaid benefit status and ADI serve as proxies for socioeconomic status in the absence of patient-specific income data. The derivation of these categories and corresponding results, based on ESRD PPS enrollment in January 2020, are described below.

- Sex
 - Sex was derived from the Enrollment Database (EDB) and categorized into male and female.
 - The ESRD PPS population was 58.7 percent male compared to 46.9 percent male in the non-ESRD Medicare population.
- Age
 - Beneficiary age (in years) was measured at the beginning of each month, and obtained from the Medicare beneficiary birth date variable in the EDB Record Identification Code (RIC) A Table. The following seven age groups were used for all age-related analyses presented for this TEP: age 12 and younger, 13-17, 18-44, 45-59, 60-69, 70-79, and 80+.
 - The ESRD population was younger than the non-ESRD Medicare population, in part because ESRD is a qualifying condition for Medicare, regardless of age, if patients otherwise meet Social Security benefit qualifications. Approximately 40 percent of the ESRD PPS beneficiary population was younger than 60 years; of the non-ESRD Medicare population, approximately 10 percent were younger than 60.
- Original Medicare entitlement

- ESRD beneficiaries were stratified into four mutually exclusive categories based on their original Medicare entitlement: (1) less than 65 years of age and had both ESRD and disability at time of enrollment; (2) less than 65 years of age and had ESRD at time of enrollment; (3) less than 65 years of age and were disabled at time of enrollment; and (4) aged into Medicare (and were diagnosed with ESRD after turning 65). These categories are constructed from EDB RIC Table X.
- The ESRD population had a higher proportion of beneficiaries entitled to Medicare due to disability compared to the non-ESRD Medicare population: 47 percent of the ESRD population was originally eligible for Medicare due to disability (with or without ESRD), compared to 21 percent for the non-ESRD Medicare population.
- Race and ethnicity
 - Beneficiary race and ethnicity information was derived from the Research Triangle Institute (RTI) race algorithm, as obtained from CMS Common Medicare Environment (CME) data.⁶ This algorithm results in six mutually exclusive categories: Non-Hispanic White, Black/African American, Asian or Pacific Islander, Hispanic, American Indian or Alaska Native, and Other/Unknown.
 - Non-White beneficiaries comprised a larger proportion of the ESRD PPS population compared to the non-ESRD Medicare population. This was especially true of the Black/African American population, which comprised 34.5 percent of the ESRD population, compared to 8.9 percent of the non-ESRD Medicare population.
- Urban and rural residency
 - The Core-Based Statistical Area (CBSA) designations were used to determine urban or rural residency status. Beneficiaries whose county of residence was located within a CBSA were deemed urban residents.
 - ESRD beneficiaries were more likely to reside in urban areas than the non-ESRD Medicare population. Approximately 84 percent of ESRD beneficiaries lived in urban areas, compared to approximately 79.6 percent of the non-ESRD Medicare population.
- Socioeconomic status proxies – Two measures were used to approximate beneficiaries’ financial and socioeconomic status: Medicare and Medicaid benefit status among Part D enrollees and the ADI.
 - Medicare and Medicaid benefit status among Part D enrollees

⁶ <https://resdac.org/cms-data/variables/research-triangle-institute-rti-race-code>

- Among Part D enrollees, Medicare benefit status was derived from monthly enrollment status and low-income status in EDB. Both the beneficiary’s dual eligibility status (whether the beneficiary was eligible for both Medicare and Medicaid in a given month) and premium subsidy status (whether the beneficiary was receiving any level of premium subsidy in a given month) were considered in determining the beneficiary’s Medicare benefit status, resulting in these four mutually exclusive categories used throughout the TEP:
 - Beneficiaries enrolled in Part D, dually eligible for Medicaid, and receiving a premium subsidy
 - Beneficiaries enrolled in Part D, not dually eligible for Medicaid, and receiving a premium subsidy
 - Beneficiaries enrolled in Part D, not dually eligible, and not receiving a premium subsidy
 - Beneficiaries not enrolled in Part D. This population is excluded from analyses as fewer than 0.5 percent of dually eligible beneficiaries were not enrolled in Part D in 2019; therefore, this category essentially comprises beneficiaries who are non-dual and not enrolled in Part D.
- 42.5 percent of ESRD PPS beneficiaries were dually eligible for Medicare and Medicaid as compared to 15.4 percent of the non-ESRD Medicare population.
- As compared to the non-ESRD Medicare population, ESRD beneficiaries were more likely to be enrolled in Part D (73 percent ESRD PPS as compared to 61 percent non-ESRD Medicare). Among ESRD PPS beneficiaries, Non-Hispanic White beneficiaries were less likely to be enrolled in Part D compared to other groups.
- The ADI is a measure constructed by the Health Resources and Services Administration. It has been validated, refined, and adapted by researchers at the University of Wisconsin, Madison, to rank neighborhoods (geographically localized communities within larger cities, towns, suburbs, or rural areas) by socioeconomic disadvantage, specifically factoring in income, education, employment, and housing quality. From these percentile rankings, five mutually exclusive categories of ADI rankings are constructed:⁷
 - 1st to 5th percentile (least disadvantaged)

⁷ A category for unknown ADI ranking was also constructed. Results for this group were not shown during the TEP.

- 6th to 25th percentile
 - 26th to 75th percentile
 - 76th to 95th percentile
 - 95th to 100th percentile (most disadvantaged)
- ESRD beneficiaries were more likely to live in socioeconomically disadvantaged neighborhoods compared to non-ESRD Medicare beneficiaries. Approximately 29 percent of the ESRD PPS population resides in the most disadvantaged ADI percentiles (76th to 100th percentile) compared to 19.2 percent of non-ESRD Medicare beneficiaries.
 - ESRD beneficiaries who are socioeconomically disadvantaged (using either proxy) were more likely to be enrolled in Part D than those less disadvantaged.

Compared to the non-ESRD FFS Medicare population, FFS beneficiaries receiving dialysis are disproportionately young, male, disabled, African-American, low income as measured by dually eligible Medicare/Medicaid status, and more likely to reside in an urban setting.

2.1.2 Summary of Discussion

Following the presentation of the ESRD PPS Overview, panelists discussed a range of topics, including labor categories used in dialysis care, subpopulations at risk of health disparities that are not currently captured, and pediatric dialysis.

Labor Categories in Dialysis Care

Panelists requested more detail about labor costs and how they figured into payment calculations. One panelist sought to clarify which facility staff positions were associated with the labor portion of dialysis costs. Acumen noted that direct patient care labor categories include social workers, nutritionists, and other staff, but do not include nephrologists, as they are paid separately. Acumen noted that the dialysis facility cost report included separate lines for administrative and managerial staff. Acumen also explained that the base rate can be broken down into a labor-related portion and a non-labor-related portion, and that the labor-related portion is multiplied by the facility's CBSA wage index for the included job categories. In areas of the country with high wages, the wage index value usually exceeds one, increasing the labor-related portion of the base rate. Acumen also confirmed that the wage index operates on a three-year lag. Finally, Acumen noted that the current wage index for the ESRD PPS is based on a pre-

reclassified acute care hospital wage index and not one derived specifically from dialysis facilities' costs.⁸

Other Subpopulations at Risk of Health Disparities

Panelists suggested that CMS consider the identification of several other patient groups at risk of health disparities. They specified beneficiaries at facilities with low physician-to-patient ratios, as a lack of sufficient physician staffing could lead to poor access to care. One panelist suggested those who live in proximity to environmental toxins be considered an “at-risk” population, as they tend to also have a number of social characteristics that are susceptible to healthcare disparities. Panelists also noted that patients who were homeless, undocumented, have limited English proficiency, or have mental health issues should be considered subgroups at risk as well. Lastly, panelists stressed that many patients belong to multiple subpopulations that are at risk of health disparities.

Pediatric Dialysis

Panelists expressed reservations about the depiction of the pediatric patient population, feeling that it was incomplete and lacked context. One panelist noted that, based on their experience, roughly a third of pediatric dialysis patients are covered by Medicare and another third are covered by Medicaid, but most of these patients are not dually eligible for Medicare coverage. The panelist further noted that the pediatric population suffers disproportionately from poverty and tends to be people of color.

2.1.3 Key Findings from Panelist Discussion

- Panelists agreed that the subpopulations highlighted in the presentation are of interest when trying to identify health disparities, and emphasized that many patients fit into more than one high-risk subpopulation.
- Panelists emphasized that there are additional subpopulations to consider for health disparities that are not included in these analyses, including beneficiaries who are homeless, undocumented, have limited English proficiency, and have mental health disorders.
- Some panelists questioned whether the ADI was the best measure of neighborhood disadvantage to use for this purpose as it does not consider availability of health resources. At the facility level, panelists suggested that facilities located in areas with low physician-to-patient ratios and in disadvantaged areas also be considered.

⁸ The pre-reclassified wage index is the value of the index before changes are made to accommodate different labor markets or a wage floor. In the context of the ESRD PPS, “pre-reclassified” means that wages for all hospital registered nurses are combined to obtain the CBSA-specific wages for registered nurses in dialysis facilities.

- Panelists felt that depicting only the Medicare-covered fraction of the pediatric dialysis population does not provide an adequate picture of the health disparities faced by this patient subpopulation.

2.2 Payment Accuracy

In the first of three topical sessions reviewing health disparities in the ESRD PPS, Acumen presented the results of its analysis of payment accuracy for dialysis treatment stratified by selected patient- and facility-level characteristics.⁹ Payment accuracy, for the purposes of this presentation, is defined as how well payment for ESRD PPS treatment aligns with costs incurred for providing the treatment. The purpose of the analysis was to explore differences in payment accuracy among patient groups and provider types that might exacerbate health disparities. The ensuing discussion explored the extent to which patterns in the data reflected panelists’ observations and experience. This session included the following topics:

- Definition of payment accuracy
- Description of payment accuracy across patient subgroups
- Description of payment accuracy across facility types

2.2.1 Summary of Presentation

To conduct the analysis for this session, Acumen utilized patient population stratifications similar to those described in Section 2.1.1. Each ratio was adjusted using a statistical regression to control for differences in patient characteristics. Results were derived from 2018-2020 cost report data, 2019 CROWNWeb Clinical Extract data, and 2019 72x claims.

Definition of Payment Accuracy

“Payment accuracy” refers to the extent to which payments are aligned with observed costs. This metric was calculated using the following payment-to-cost ratio for a given patient-month:

$$\text{Raw Payment-to-Cost Ratio} = \frac{\text{Total ESRD PPS Payment per Treatment}}{\text{Total Estimated Cost per Treatment}}$$

In the above equation, “payment” means total Medicare-allowed payment including ESRD PPS base payment, outlier payment, and other adjustments. Cost per treatment was derived from CR and FSB costs from facility-level cost reports and beneficiary-level claims, with CR costs apportioned to each patient’s treatment duration and accounting for missed treatments.

⁹ “Patient-level” henceforth refers to provider-beneficiary-month-level.

To reflect the level of payment accuracy for each group of interest relative to a national average, the payment-to-cost ratios were standardized to have a national mean and standard deviation of 1. Therefore, payment-to-cost ratios greater than 1 indicate that payment exceeded cost for this subgroup, relative to the national mean, while ratios less than 1 indicate that costs exceeded payment relative to the national mean. Furthermore, since patient characteristics can affect costs of treatment for any particular patient or facility type, these ratios were adjusted using a statistical regression to control for other patient characteristics, as discussed in Section 2.1.1. These include socioeconomic status (Medicare and Medicaid benefit status and ADI ranking), sex, age category, race/ethnicity, original Medicare entitlement category, and beneficiary location (urban/rural). The resulting adjusted average payment-to-cost ratios represent the degree of concordance between estimated incurred costs and total Medicare-allowed payments for the average beneficiary in each subgroup of interest, assuming all other variables are held constant. All calculations were made using 2019 72x claims data.

- Payment-to-cost ratio = 1: payment relative to cost is at the national average
- Payment-to-cost ratio greater than 1: payment relative to cost is higher than the national average
- Payment-to-cost ratio less than 1: payment relative to cost is lower than the national average

Payment Accuracy across Patient Subgroups

Payment accuracy differences found among various patient groups were as follows:

- The adjusted average payment-to-cost ratios across demographic characteristics (beneficiary sex, location, and race/ethnicity) differed by 2 percent or less from the national average, with the exception of payments for Asian/Pacific Islander beneficiaries, for whom there was a 3 percent underpayment compared to the national average.
- Adjusted average payment-to-cost ratios also showed little variation among socioeconomic strata: these ratios were close to 1 across all Medicare and Medicaid benefit status subgroups, and varied only slightly across national ADI rankings. The most disadvantaged neighborhoods were slightly underpaid (0.99) and the less disadvantaged neighborhoods, the 1st to 5th and 6th to 25th percentiles, were slightly overpaid relative to the national average, with payment-to-cost ratios of 1.02 and 1.03, respectively.
- Payment for pediatric dialysis treatment was the most underpaid of any ESRD beneficiary group.
 - Payment-to-cost ratios for patients age 12 years and younger and for those ages 13-17 were 0.83 and 0.87, respectively.

- In contrast, the adjusted average payment-to-cost ratio for patients ages 18-45 was 1.13.
- Payment-to-cost ratios for patients older than 45 years were very close to 1.

Payment Accuracy across Facility Types

There are several explanations for why costs per treatment may differ across facility types, such as facility treatment volume, local prevailing wages, rent, state and local government policies, and other factors. As such, the ESRD PPS includes several facility-level adjustments with the goal of ensuring payment accuracy despite these factors, including adjustments for low-volume facilities, rural/isolated facilities, and the wage index, discussed in Section 2.1.1. Examination of adjusted average payment-to-cost ratios across facility types revealed some geographic variation in payment accuracy.

Rural Facilities

- The adjusted average payment-to-cost ratio for rural facilities was slightly lower than for urban facilities (0.97 and 1.01 respectively), despite the application of the rural adjustment.¹⁰
 - Among rural facilities, payment disparity was most pronounced in the least disadvantaged ADI ranking. Neighborhoods with ADI rankings in the 1st to 5th percentile experienced payment-to-cost ratios of 0.84, compared to the 0.97 average for all rural facilities. All other neighborhood rankings adhered close to the mean payment-to-cost ratio of 0.97.

Low-Volume Facilities

- Facilities that received the low-volume payment adjustment (LVPA) in 2019 had an adjusted average payment-to-cost ratio of 0.91, compared to a ratio of 1 for non-low-volume facilities, despite the positive LVPA.¹¹
 - The payment disparity observed for LVPA facilities was most pronounced for American Indian/Alaska Native patients, for whom the average adjusted payment-to-cost ratio was 0.81.

¹⁰ Rural facilities are defined as those that are not located in a CBSA.

¹¹ To be eligible to receive the LVPA in a given year, a facility must have furnished fewer than 4,000 treatments per year in each of the previous three years. During this three-year period, the facility must not have opened, closed, or received a new provider number due to a change in ownership. Lastly, if multiple facilities under the same ownership are located within five road miles of each other, their treatment counts are summed together when determining LVPA eligibility.

- When quantifying facility size categorically using annual treatment counts in 2019, facilities that furnished less than 4,000 treatments saw an adjusted average payment-to-cost ratio of 0.73. This ratio gradually increased to 1 as facility size increased.
 - This graded increase likely measures economies of scale, and suggests that fixed operational costs incurred by all facilities are recouped as treatment counts increase.

Geographically Isolated Facilities

- The effects of geographic isolation on payment accuracy were seen only for the most severely isolated ESRD facilities: those located greater than 50 miles away from the next nearest facility.¹²
 - The adjusted average payment-to-cost ratio for the most isolated providers was 0.92.

Wage Index and Facility Ownership Type

- For facilities with wage indexes equal to or above 1.2 (that is, for facilities for which the labor-related portion of the base rate increases by at least 20 percent), payment was roughly 8 percent higher than estimated costs, while payments evenly matched costs for facilities with wage indexes lower than 1.2.
- Hospital-based facilities had lower adjusted average payment-to-cost ratios at 0.87 compared to approximately 1 for all other facility types.
 - This finding likely can be attributed to a higher proportion of underserved patient subgroups that receive dialysis treatment at hospital-based facilities and treatment costs being higher hospital-based facilities as compared to free-standing facilities.

2.2.2 Summary of Discussion

In response to the presentation on payment accuracy, panelists raised questions about the derivation of costs for Acumen’s payment accuracy calculations and discussed several topics related to the identification of factors associated with high-cost treatment. Panelists also suggested changes to the payment system aimed at addressing disparities in payment accuracy.

Derivation of Costs for the Payment-to-Cost Ratio

One panelist inquired about the methodology that Acumen used to derive beneficiary-specific costs from the cost reports. The panelist also asked about the use of missed treatments. The Acumen team explained that it estimated cost per treatment using CR and FSB costs from claims and cost reports. To construct CR costs, all beneficiaries were assumed to need hemodialysis treatments three times per week, or peritoneal dialysis treatments seven days per

¹² Geographic isolation was defined as the driving distance in miles from the nearest ESRD facility. The six constructed groups were: <0.5 miles, 0.5- <2 miles, 2- <5 miles, 5- <10 miles, 10- <50 miles, ≥50 miles.

week. In cases where there were fewer than three hemodialysis treatments per week or seven peritoneal dialysis treatments per week for a beneficiary, an extra portion of the facility's CR costs was allocated to that patient to account for the missed treatment. This resulted in an increased per-treatment cost for patients with greater numbers of missed treatments. CR costs were also derived using duration (in minutes) of the dialysis treatment session, such that the longer a patient underwent dialysis, on average, the greater proportion of the facilities' costs were allocated to this patient. FSB costs were derived using line item charges on claims. In response to this explanation, one panelist commented that missed treatments are more likely to occur at facilities located in the more disadvantaged ADIs.

Geographic Isolation

Panelists discussed at length the relationship between geographic isolation, patient access to care, and resulting costs. One panelist commented that quantifying facility isolation using driving distance to the next nearest facility is not an informative metric when assessing access to care in densely populated cities. This panelist suggested that Acumen consider access to public transportation as a marker of facility isolation in urban areas.

Panelists also noted that in their experience, communities that were geographically isolated were also likely to have few primary care facilities and are also more likely to be “food deserts.” Consequently, beneficiaries in these communities suffer from a host of medical care disparities, including unaddressed comorbidities such as diabetes, hypertension, and obesity, leaving these patients with a greater burden of disease and eventually driving up the cost of care. One panelist posited that disparities in primary care access tied to geographic isolation also may explain payment accuracy disparities observed for the American Indian/Alaska Native population. Panelists urged CMS to consider an upward payment adjustment for isolated facilities in areas where low income and low resources drive up the costs of care.

Identifying High-Cost Patient Populations

Panelists also identified several patient subpopulations whose dialysis treatment entails significantly increased costs, but who are not accounted for under the current payment system. These include patients with housing insecurity, as they are ineligible for transplants and home dialysis and thus must dialyze in-center indefinitely. Panelists explained that lack of a legal address creates similar barriers for the migrant worker population, and noted that these patients also become long-standing in-center dialysis patients by default. Patients who are disabled, in hospice, or are amputees requiring extensive wound care are also more expensive for facilities because of their more intensive use of direct patient care labor and other resources. Panelists also explained that patients who lack the ability to become treatment compliant can become costly to treat. According to one panelist, the non-treatment-compliant include nursing home patients. This panelist claimed that nursing homes were not able to enforce dietary restrictions and fluid

intake, resulting in costly complications for their dialysis patients. Panelists observed that patients with limited English proficiency or low health literacy were more likely to have a poor sense of self-efficacy, may not understand the consequences of non-compliance, and thus tend to miss treatments at a higher rate than other patient groups. Several panelists emphasized the relationship between medical adherence and access to transportation, citing lack of access to transportation as one of the largest drivers of missed treatments. One panelist also noted that they have observed that patients miss dialysis sessions because of complications related to family member incarceration. Several panelists also suggested that the payment accuracy discrepancies observed for pediatric patients were underestimated, since the current cost reports do not capture various pediatric-specific staffing and supply costs, and thus underestimate the true cost of furnishing care to this patient population.

Using Social Determinants of Health

Panelists strongly suggested that to better characterize the factors associated with increased treatment costs for high-risk and vulnerable patient populations, standardized information regarding social determinants of health (SDOH) should be collected. Several panelists recommended that better use be made of the 2728 ESRD Medical Evidence Report Form, which is completed at the initiation of dialysis.¹³ One panelist suggested that SDOH screening tools could be embedded in current patient enrollment materials, while others noted that questions regarding SDOH could be introduced on third-party patient experience surveys. Another panelist noted that social workers, who in their view have the greatest familiarity with patients' social and cultural background, might be the most appropriate party to conduct interviews or administer surveys on SDOH. Other panelists stressed the importance of fostering opportunities for patients to self-report these measures, rather than having social determinants presumed about them. These panelists expressed the view that ideally, this should be done in a setting that ensures patients' privacy and confidentiality, as patients may not want to disclose sensitive information in the presence of other patients or facility staff. Panelists also recommended that this information be collected using V codes in Medicare claims so that it would be updated on a regular basis, but cautioned that this would increase reporting burden on the facilities. Panelists suggested that modifications to the cost report would allow facilities that furnish pediatric treatments to report more granular and accurate data regarding pediatric-specific supplies and staffing, thus better estimating pediatric costs. Panelists also suggested that placing a modifier on claims to indicate the need for intensive resource utilization during dialysis (e.g., for amputees) may help better identify these costly patients.

¹³ <https://www.cms.gov/medicare/cms-forms/cms-forms/downloads/cms2728.pdf>

Suggested Revisions to the Payment System

Panelists also identified ways in which the payment system could be modified in the future to better address the payment disparities displayed in Acumen’s presentation as well as those observed in their professional settings. One panelist noted that isolated, rural, and low-volume facilities seem to have costs that outpace payments, and that this issue could be due to their view that the current payment system is unable to account for economies of scale. Panelists suggested that the payment system should provide adjustments better tailored to reflect costs incurred by these facilities. Another panelist suggested that comorbidities should include diabetes, and that there should be an adjustment for patients who require extensive wound care. One panelist asked if home dialysis was considered as an adjustment factor. Acumen explained that the ESRD Treatment Choices (ETC) Model is currently testing the potential effects of home dialysis payment adjustments, and that there will be more information regarding such adjustments in the future. One panelist expressed concern that the increase of the Medicare Advantage population and corresponding decrease of the ESRD PPS population would result in an overall reduction in payment through the ESRD PPS.

2.2.3 Key Findings from Panelist Discussion

- Panelists largely agreed that there was general alignment of costs and payments through the ESRD PPS, but they noted that there were patient risk groups and provider types for which payments were inadequate.
- Panelists noted that patients who are hindered in their access to care, including those with housing insecurity, language barriers, lack of transportation, low health literacy, and multiple comorbidities, often require more intensive care from dialysis staff compared to patients without these hindrances, and this can result in higher costs per treatment.
- Panelists strongly supported the collection of data on SDOH and the incorporation of these data into the payment model.

2.3 Treatment Patterns

After examining the relationship of payment to costs across various patient populations at risk of health disparities in the previous session, the TEP next examined disparities in treatment patterns observed from existing data. The objective of this session was to obtain feedback from panelists on differences in treatment patterns across demographic characteristics and other risk factors among ESRD beneficiaries and to obtain insights from the panel on unaccounted disparities that are not captured by current data. Acumen analyzed data and presented results on the following topics:

- Home dialysis use

- Vascular access type
- Treatment frequency and missed treatment
- Travel times to dialysis facilities
- Utilization of separately billable drugs, labs, and supplies

2.3.1 Summary of Presentation

The analyses conducted for this session utilized patient population stratifications similar to those described in Section 2.1.1. All outcomes were adjusted for several factors using a statistical regression to control for differences in patient characteristics: socioeconomic status (Medicare and Medicaid benefits status and ADI ranking), sex, age category, race/ethnicity, original Medicare entitlement category, and beneficiary location (urban/ rural). Results were derived from 2019 ESRD FFS claims and were presented at the patient-month level, and represent the average adjusted percentage per month across all months in 2019, unless otherwise stated. When relevant, treatment patterns were also stratified by facility characteristics to determine whether disparities observed in payment accuracy were reflected in treatment patterns.

Home Dialysis

Home dialysis utilization has only modestly increased among the overall ESRD population since the implementation of the ESRD PPS in 2011, from approximately 9 percent of beneficiaries in 2011 to approximately 13 percent in 2020. In recent years, there have been initiatives to increase home dialysis, including the ESRD Treatment Choices Model, which was implemented in 2021.¹⁴ Using 72x claims data from 2018-2020, the following home dialysis trends across patient populations were evident:

- Utilization modestly increased across the three years for all subpopulations.
- Utilization was highest among beneficiaries who were originally entitled to Medicare on the basis of ESRD only (17 percent in 2020) and lowest among beneficiaries originally entitled on the basis of disability only (10 percent in 2020).
- Utilization did not materially differ by sex; approximately 13 percent of both females and males received home dialysis in 2020.
- Younger beneficiaries (ages ≤ 17) were markedly more likely than adult beneficiaries to dialyze at home. In 2020, approximately 60 percent of beneficiaries age 12 or younger

¹⁴ The ESRD Treatment Choices Model was designed by the CMS Innovation Center, and is being implemented from January 1, 2021 through June 30, 2027. The model's primary goals are to increase home dialysis use and kidney transplants among ESRD beneficiaries. For more information, refer to <https://innovation.cms.gov/innovation-models/esrd-treatment-choices-model>.

and approximately 42 percent of beneficiaries ages 13-17 dialyzed at home. For all adult age groups, the percentage of beneficiaries dialyzing at home was less than 20 percent.

- Utilization varied by race/ethnicity; Non-Hispanic White beneficiaries were the most likely to dialyze at home (approximately 16 percent in 2020). Home dialysis utilization is second-highest among Asians/Pacific Islanders, with approximately 14 percent dialyzing at home in 2020. Less than 10 percent of Black/African American, Hispanic, and American Indian/Alaska Native beneficiaries dialyzed at home across the three study years.
- Utilization was lower among lower-income beneficiaries, as measured using each of the proxies for income status. Approximately 9 percent of beneficiaries in the most economically disadvantaged groups dialyzed at home in 2020, compared to 16 percent of non-dually eligible beneficiaries with no premium subsidy and 12.5 percent of the least disadvantaged ADI group.
- Utilization was higher among rural beneficiaries (14.5 percent in 2020) than urban beneficiaries (12 percent in 2020).
- Trends in patient subgroups did not differ materially across facility characteristics.

Vascular Access Type

Fistulas have been promoted over grafts and catheters since the early 2000s through the Fistula First Initiative. The ESRD Quality Incentive Program (QIP) currently incentivizes the use of fistulas. More recently, there has been a rethinking of the Fistula First approach: the National Kidney Foundation (NKF) revised clinical practice guidelines with a patient life-plan approach to vascular access.¹⁵ Using 2019 data from hemodialysis patients, the following trends in vascular access types were observed:

- Older patients were more likely to use grafts and less likely to use fistulas compared to younger adults. Pediatric patients have a markedly higher use of catheters.
- Females had lower usage of fistulas and higher usage of grafts and catheters compared to males.
- Vascular access type varies by race/ethnicity: Black/African American beneficiaries had markedly higher usage of grafts and lower usage of fistulas and American Indian/Alaska Native beneficiaries had notably higher use of fistulas and lower usage of grafts.

¹⁵ [https://www.ajkd.org/article/S0272-6386\(19\)31137-0/fulltext](https://www.ajkd.org/article/S0272-6386(19)31137-0/fulltext)

- Lower-income beneficiaries were slightly less likely to use fistulas than higher-income beneficiaries.
- Beneficiaries entitled to Medicare originally through disability only had lower usage of fistulas compared to beneficiaries who had other reasons for original Medicare entitlement.
- Trends in patient subgroups did not differ materially across facility characteristics.

Treatment Frequency and Missed Treatments

For hemodialysis, the standard of care for the ESRD PPS consists of three four-hour treatments per week for patients undergoing in-facility treatment. Payment policies were established by CMS using this standard. Adequate treatment frequency for ESRD patients is essential, as less frequent treatment can lead to complications including fluid overload, mineral imbalances, bone loss, and heart failure. Missed treatments may, however, indicate that the patient encounters obstacles preventing access to treatment, including transportation problems, housing insecurity, behavioral or mental health issues, or drug dependency issues. Based on 2019 claims data, the following trends in treatment frequency were observed:

- Pediatric beneficiaries had slightly higher in-center hemodialysis treatment frequency compared to adult beneficiaries, which is consistent with common pediatric dialysis practices. Pediatric patients often require lower-intensity, more frequent treatments because of their age and smaller body size. Beneficiaries 12 years of age and younger and those ages 13-17 averaged 3.08 and 2.95 in-center hemodialysis treatments per week, respectively, while all adult age groups averaged 2.85 treatments or less.
- Home hemodialysis treatments averaged approximately four per week, although this frequency is seen to decline as beneficiaries age. Beneficiaries aged 80 years and older averaged 3.67 home hemodialysis treatments per week.
- For beneficiaries receiving home peritoneal dialysis, average treatment frequencies were similar across all patient subgroups, at approximately 6.75 treatments per week.
- Treatment frequencies for all modalities were generally similar across races/ethnicities and for each level of the two proxy measures used to estimate income status.

Operating under the assumption that a patient should have three in-center hemodialysis treatments per week, the following trends in missed in-center hemodialysis treatments based on 2019 claims data were observed:

- Pediatric patients were least likely among the age categories to miss a treatment; less than 13 percent of pediatric beneficiaries missed a treatment in a given month compared to roughly 25 percent of adult beneficiaries who missed a treatment in a given month.
- American Indian/Alaska Native beneficiaries were the most likely among races/ethnicities to miss a treatment, with 30 percent missing a treatment in a given month. Black/African American beneficiaries were second-most likely to miss a treatment in a given month, with roughly 27 percent missing a treatment. Asians/Pacific Islanders were least likely to miss a treatment, with 18 percent missing a treatment.
- Lower-income beneficiaries were more likely to miss treatments compared to higher-income beneficiaries. Over 27 percent of the beneficiaries in the lower-income groups missed a treatment in a given month in 2019, compared to approximately 20-22 percent of beneficiaries in higher-income groups.
- Urban beneficiaries were more likely to miss treatments compared to rural beneficiaries, 25 percent compared to 22 percent, respectively.
- The percentage of beneficiaries with missed treatments was similar for females and males.
- Overall, the number of missed treatments was very small, across facility types. On average, only 0.1 percent of treatments were missed.

Travel Times

Travel time to dialysis facilities are important indicators of treatment accessibility. Driving times were used for purposes of this presentation. Driving times were calculated from the Open Source Routing Machine (OSRM) and do not account for traffic delays or the use of public transportation. Additionally, only travel times to in-center dialysis treatments were included in the analyses, which were conducted at the treatment level. Based on 2019 claims data, the following trends were observed:

- Average driving times to dialysis facilities were higher for pediatric beneficiaries (ranging from 39 to 45 minutes) compared to adult beneficiaries (approximately 15 minutes). Lengthier driving times are likely the result of the location of most pediatric dialysis treatments in children’s hospitals or other medical center/specialized hospital setting, which are fewer in number and located farther apart than neighborhood dialysis facilities. However, it is important to note that the majority of pediatric beneficiaries dialyze at home, and driving times were calculated only for in-facility treatments.
- Among races/ethnicities, American Indian/Alaska Native beneficiaries had notably longer average driving times to facilities, averaging 24 minutes compared to 16 minutes

or less on average for all other races/ethnicities. This could partly explain their slightly higher likelihood to miss treatments.

- Travel times for rural beneficiaries were longer compared to urban beneficiaries, 22 minutes compared to 13 minutes, respectively.

Use of Separately Billable Services

Separately billable services in the ESRD PPS include certain drugs, labs, and supplies. In this section, the results represent the Medicare Allowable Payment (MAP) amount per treatment, which accounts for the amount of a given drug/lab/supply reported on claims for a beneficiary.

- Overall, calcimimetics and erythropoietin-stimulating agents (ESAs) were responsible for most (approximately 82 percent) separately billable spending.
- Among races/ethnicities, Black/African American beneficiaries had the highest utilization of drugs, labs, and supplies.
- Lower-income beneficiaries generally had higher utilization of drugs, labs, and supplies compared to higher-income beneficiaries.
- Pediatric patients had lower utilization of drugs, labs, and supplies compared to adult beneficiaries. This is likely attributable to the smaller size and body weights of pediatric patients.
- Usage was generally similar across beneficiary location (urban/rural) and sex.

2.3.2 Summary of Discussion

Following the presentation on differences in treatment patterns among subgroups of the ESRD patient population, the panelist discussion focused on the following topics: home dialysis, additional data elements that should be collected, potential payment changes to address disparities, transportation, and pediatric dialysis. Panelists discussed potential reasons for differential use of home dialysis modalities and the need to track preventive care measures delivered through the more advanced stages of chronic kidney disease (CKD). They also felt that better data on such patient characteristics as health literacy and English language proficiency would help policymakers better understand treatment choices and treatment adherence. Additionally, panelists felt that more robust measures were needed to understand the effects of transportation availability on treatment. Finally, they reiterated the need for more finely tuned cost data for pediatric dialysis.

Home Dialysis

Some panelists expressed concern at the lower rates of home dialysis among traditionally vulnerable populations, specifically low-income and Black/African American beneficiaries. One

panelist noted that in their experience, there is a lack of dialysis facilities that offer home programs in underserved communities. However, another member of the panel described the difficulties of furnishing home dialysis through their facilities. The panelist noted that some patients may not be dialyzing at home because they failed home dialysis or were simply older and not healthy enough for home dialysis. They also noted that they visit each prospective home dialysis patient's home to determine if the setting is safe and clean enough for administering dialysis, and in their experience the homes of some low-income patients are unfit for home dialysis. Lastly, this panelist remarked that home dialysis is costlier, particularly due to a limited number of vendors, and these costs have significantly increased during the COVID-19 pandemic, specifically noting the increase in wages paid to nurses. Finally, panelists noted that while all home dialysis patients must rely on vendors for delivery of supplies and replacement/maintenance of dialysis machines, it is especially difficult in some rural areas to ensure vendor accountability, which can lead to treatment delays.

Additional Data Elements to Collect

Panelists emphasized the importance of late-stage CKD care management in determining appropriate treatment for patients who develop ESRD, both during the onset period and later. They further noted that whether the patient was properly educated on dialysis care before transitioning to ESRD or the patient “crashed” into dialysis is a significant factor in patients’ treatment needs and health outlook. Panelists argued that data on late-stage CKD care should be captured. Acumen noted that data on pre-ESRD care for many patients are currently not available since many are not enrolled in Medicare prior to being diagnosed with ESRD, but that facilities participating in the Kidney Care Choices (KCC) Model will be reporting data on late-stage CKD care. The model began operating on January 1, 2022.¹⁶ The panel discussed the option of updating the 2728 ESRD Medical Evidence Report to better capture this information, with several panelists expressing support for this. Some panelists also supported having the 2728 ESRD Medical Evidence Report updated periodically for ESRD patients.

Some members of the panel expanded on their thoughts regarding other data elements that could be collected. Panelists noted that the 2728 ESRD Medical Evidence Report could also be used to capture data on health literacy and English proficiency, as these can be barriers to a higher quality of care. This panelist noted that some dialysis patients without English fluency in the panelist’s hospital commented that they were never approached with the possibility of home dialysis or transplant. Members also indicated that data on other SDOH could be collected as

¹⁶ The Kidney Care Choices Model was designed by the CMS Innovation Center, and will be implemented from January 1, 2022 through December 31, 2026. The primary goals of the Model include incentivizing providers to improve the quality of care for Medicare beneficiaries with late-stage CKD (stages 4 and 5) and ESRD, as well as incentivizing kidney transplantation. For more information, refer to: <https://innovation.cms.gov/innovation-models/kidney-care-choices-kcc-model>.

well, either on the 2728 ESRD Medical Evidence Report or on other sources such as cost reports or claims. One panelist noted that information on why a patient failed on home peritoneal dialysis should be documented. Another panelist stressed that additional funding as a result of new information on SDOH should be allocated to the facilities that are treating a high number of the relevant patients. On the other hand, another panelist maintained that while this additional data would be useful, it could introduce additional administrative burden for providers. Another panelist suggested a shift in focus regarding the discussion around data. They suggested that the focus should be on taking action based on the data already available instead of the focus being on collecting more data.

Payment Changes to Address Disparities

Panelists offered ideas on payment changes that could potentially address apparent disparities in treatment patterns. One panelist noted that the KCC Model includes equity measurements, and depending on the success of that model, those measurements could be part of the basis for determining payment. This panelist emphasized that if data are collected on SDOH that are associated with a barrier to accessing treatment, there should be a payment or another mechanism to directly improve the given SDOH. Another panelist suggested that additional funds be made available for three program initiatives: (1) pre-ESRD care and education, (2) transportation assistance, and (3) social worker support, both in terms of increasing staff and raising salaries. A few panelists argued that more funding should be allocated to allow dialysis providers to work with community health workers and leaders to assist vulnerable patients. One of these panelists noted that community health workers carry out essential activities for their dialysis patients, including providing translation and educational and emotional support. This panelist further noted that these community health workers could also help alleviate the additional administrative burden from reporting SDOH that another panelist mentioned earlier, and in their view the reporting by these workers would improve accuracy due to the level of trust that is built between the patients and these workers. Similarly, another panelist suggested a wage adjustment for staff that can assist hesitant patients in initiating home dialysis, specifically those in minority populations and those whose native language is not English. Lastly, one panelist emphasized that any changes to payments must be allocated accurately, since redistributing payments inaccurately means removing money from another part of the payment system.

Transportation

Panelists commented on transportation issues for dialysis patients. They noted that driving times are not necessarily the best measure for gauging travel times to facilities. Panelists noted that some patients are not able to drive, while others, such as those living in urban areas, take public transportation to their treatments.

Pediatric Dialysis

One panelist emphasized that pediatric dialysis providers make a pointed effort to provide home dialysis to pediatric patients for whom it is appropriate, which is why pediatric patients have notably higher home dialysis rates compared to adult beneficiaries. This panelist also noted that pediatric patients have higher rates of catheter usage because many of the patients are not suitable for fistulas. Lastly, the panelist commented on the lower observed utilization of supplies among pediatric patients compared to adult patients. They noted that these results overlook the fact that pediatric patients must use specially designed and specially sized supplies, which leads to higher costs.

2.3.3 Key Findings from Panelist Discussion

- Panelists agreed that late-stage CKD care is important in determining a patient’s treatment patterns, both in the ESRD onset period and beyond
- Panelists expressed support for additional data on SDOH to be collected. In particular, they supported updates to the 2728 ESRD Medical Evidence Report, including collecting information on pre-ESRD care, and some panelists also supported periodic updates to the form.
- Panelists agreed that action should be taken to increase home dialysis use among the patient groups most vulnerable to experiencing health disparities.
- Panelists suggested changes or adjustments to payment policies that would have the potential to eliminate or ameliorate some disparities in treatment. These include:
 - Adapting the equity measurement from the KCC Model (if it proves effective) as a basis of payment
 - Providing more funding for social workers, both in terms of increasing staff and raising salaries
 - Providing more financial support to allow dialysis providers to partner with community health workers
 - Providing more funding for pre-ESRD care and education
 - Providing more funding for transportation assistance

2.4 Health Outcomes

The final topical session sought to facilitate discussion about whether apparent disparities in treatment patterns or payment accuracy are also present in health outcomes. In this session, Acumen reviewed health outcomes among ESRD patient subpopulations and facility types, and

sought panelist feedback on observed disparities, and disparities in health outcomes not discussed during the presentation. The session included descriptions of health outcomes across subpopulations in several key areas:

- Survival probability
- Emergency room (ER) visits
- Hospitalizations
- Anemia management events
- Fluid management events
- Cardiovascular events
- Bone and mineral management events
- Gastrointestinal events
- Vascular access complications
- Kidney transplants

2.4.1 Summary of Presentation

The analyses conducted for this session utilized patient population stratifications similar to those described in Sections 2.2 and 2.3. All outcomes were adjusted for several factors using a statistical regression to control for differences in patient characteristics: socioeconomic status (Medicare and Medicaid benefits status and ADI ranking), sex, age category, race/ethnicity, original Medicare entitlement category, and beneficiary location (urban/rural). Results were derived from 2019 ESRD FFS claims and were presented at the patient-month level, and represent the average adjusted percentage per month across all months in 2019, unless otherwise stated. Unless otherwise noted, the incidence of all outcomes increased with age. When relevant, health outcomes were also stratified by facility characteristics to determine whether disparities in payment accuracy were also found in health outcomes.

Survival Probability

The survival probability 360 days after starting dialysis among incident ESRD PPS patients in 2019 was 79.7 percent and at 720 days was 63.8 percent. Survival probabilities for subpopulations of interest are as follows:

- After initiating dialysis, low-income beneficiaries had lower adjusted survival probabilities than non-low-income beneficiaries, as measured by both socioeconomic status indicators:

- 76.9 percent of dually eligible beneficiaries survived their first year of dialysis, in contrast to 81.3 percent of Medicare beneficiaries who received no premium subsidies.
- Similarly, 78.1 percent of patients living in areas with the most disadvantaged ADIs survived their first year of dialysis, compared to 82.7 percent for incident beneficiaries living in the least disadvantaged areas.
- As widely confirmed in peer-reviewed literature, Non-Hispanic White incident beneficiaries had lower adjusted survival probabilities compared to other racial and ethnic groups:
 - Survival for Non-Hispanic White beneficiaries at one year and two years after dialysis initiation was 76.9 percent and 59.4 percent, respectively.
 - In contrast, survival for Black/African American patients at one year and two years after dialysis initiation was 83.4 percent and 69.6 percent, respectively.
 - Survival probabilities for other racial and ethnic groups were similar to those of the Black/African American population.
- Adjusted survival probabilities varied by facility size and location:
 - Facility size and survival probability appeared to be related, as survival probability gradually increased from 77 percent to 80.5 percent as treatment volume increased from less than 4,000 to greater than 10,000 treatments per facility in 2019.
 - One-year survival probability at rural facilities was 78.6 percent compared to 79.9 percent at urban facilities.

ER Visit Rates

The adjusted ER visit rate per month was 19.4 percent for the overall ESRD patient population in 2019. The results by subpopulation:

- Beneficiaries who were more economically disadvantaged tended to have higher monthly ER visit rates compared to the overall rate:
 - 21.5 percent for dually eligible beneficiaries with premium subsidies
 - 20.5 percent for beneficiaries residing in the most disadvantaged ADI neighborhoods
- Non-Hispanic White beneficiaries had an adjusted monthly ER visit rate of 20.8 percent in 2019, compared to 19.7 percent for Black/African American beneficiaries, 18.1 percent for Hispanics, 16.8 percent for American Indian/Alaska Native beneficiaries, and 14.5 percent for Asian/Pacific Islander beneficiaries.

- The adjusted monthly ER visit rate was 21.0 percent for females and 18.3 percent for males.
- Beneficiaries in the 18-44 age group and those age 80 and older had the highest adjusted monthly ER visit rates, 21.9 percent and 20.7 percent, respectively; pediatric patients age 13-17 had the lowest adjusted monthly ER visit rate, 14.6 percent.
- Beneficiaries who were originally enrolled in Medicare due to disability had a higher than average ER visit rate, 24 percent.
- Rural beneficiaries had a slightly lower than average ER visit rate, 18.8 percent.

Hospitalization Rates

Overall, the average adjusted monthly hospitalization rate for ESRD PPS beneficiaries in 2019 was 12.2 percent. Notable differences in this rate occurred as follows:

- Dually eligible beneficiaries with premium subsidy had a slightly higher average hospitalization rate at 13.3 percent. There was a slight gradient in hospitalization rates among national ADI rankings; the least disadvantaged ADI ranking had an adjusted average monthly rate of 11.8 percent and the most disadvantaged had an average monthly rate of 12.7.
- Non-Hispanic White beneficiaries had the highest monthly hospitalization rates among race/ethnicity groups at 13.7 percent, compared to the lowest rate of 9.4 percent for Asian/Pacific Islanders.
- Average rates were slightly higher for females (12.9 percent) compared to males (11.7 percent).
- Rates for the youngest beneficiaries (age 12 and under) were markedly higher (18.7 percent) compared to all other age groups.
- Rates for those whose original Medicare entitlement was due to ESRD and disability (10.3 percent) were lower compared to those whose original entitlement was for disability only (15.4 percent).
- Rates for rural residents (10.8 percent) were lower compared to urban residents (12.5 percent).

Anemia Management Events

Anemia management event rates were characterized by blood transfusion rate per month in 2019:

- Only slight differences were seen among groups. Non-Hispanic White and Black/African American patients experienced 2.2 percent transfusion rates compared to 2.1 percent for the overall ESRD population.

Fluid Management Events

The following trends in fluid management events (characterized by monthly adjusted rate of fluid overload and hypovolemia) were observed:

- Adjusted fluid overload rate per month was highest among the 18-44 age group (13.7 percent), the least disadvantaged ADI group (12.6 percent), and urban residents (10.5 percent) in comparison to the overall average of 10.2 percent.
- The monthly rate of hypovolemia was highest among pediatric patients (2.7 percent) and Non-Hispanic Whites (1.0 percent) compared to the overall average of 0.9 percent.

Congestive Heart Failure

- Lower-income and Non-Hispanic White beneficiaries had the highest adjusted monthly percentage of congestive heart failure (CHF) incidence in 2019.
- Compared to an average of 16.6 percent, dually eligible beneficiaries who also receive the premium subsidy experienced CHF incidence of 18.4 percent, and that of Non-Hispanic Whites was 18.7 percent.

Other Cardiovascular Events

The following notable trends in cardiovascular events were observed for the 2019 ESRD PPS patient population:

- Lower-income and Non-Hispanic White beneficiaries experienced slightly higher rates of CHF-related hospitalizations (indicated by principal diagnosis of heart failure on inpatient claims); monthly percentages were 1.39 percent and 1.41 percent, respectively, compared to the overall percentage of 1.23 percent.
- Approximately 0.17 percent of ESRD beneficiaries overall had a stroke-related hospitalization, negligible variation among subpopulations.
- Hospitalizations related to acute myocardial infarction (AMI) occurred for approximately 0.34 percent of ESRD beneficiaries overall, with negligible variation among subpopulations.

Bone and Mineral Management Events

The following trends in bone and mineral management events were observed:

- Compared to the overall average of 1.8 percent per month, fractures were more common among Non-Hispanic White and American Indian/Alaska Native beneficiaries (2.4 percent for both categories), and among females (2.2 percent).
- Parathyroidectomies were infrequent among all subpopulations of ESRD beneficiaries; approximately 0.029 percent of the overall ESRD PPS population received a parathyroidectomy in a given month.

Gastrointestinal Events

Gastrointestinal events were relatively infrequent among ESRD PPS beneficiaries.

- Upper GI bleeds occurred in approximately 0.41 percent of the overall ESRD population in a given month.
- Ulcers occurred in approximately 0.81 percent of the overall ESRD population in a given month.

Vascular Access Complications

The following trends were observed for vascular access complications:

- Monthly adjusted rates of vascular access complications in 2019 averaged 13.6 percent, but were higher among Black/African American patients (15.5 percent) and dually eligible beneficiaries (14.3 percent).

Kidney Transplants

Historically, kidney transplant rates have remained low for the ESRD population due to an organ shortage throughout the transplant system. In order to describe the probability that beneficiaries received a kidney transplant in 2019, a logistic regression model was run that adjusted for the patient characteristics listed in Section 2.1.1.

- Pediatric beneficiaries had the highest transplant percentages among all age groups in 2019: 22 percent and 19 percent for those younger than 13 years and 13-17 years, respectively. Transplantation rates among the adult ESRD population ranged from 6.0 percent among beneficiaries age 18-44 to less than 1.0 percent for beneficiaries aged 80 and above.
- Among racial/ethnic groups, American Indians/Alaska Natives had the lowest transplant rate, at just below 1.0 percent. Transplantation rates for all other race/ethnicity groups ranged from 1.5 to 2.2 percent.
- Transplantation rate was also lowest among low-income patients, but gradually increased as socioeconomic advantage increased: transplantation rate rose steadily from 1.1 to 2.5 percent as ADI ranking increased.

2.4.2 Summary of Discussion

The discussion that followed the presentation on disparities in health outcomes generally adhered to each of the topics covered. However, panelists focused on disparities observed in ER visits and offered their insights on possible explanations. They also commented on the difficulties in obtaining kidney transplantation. Panelists noted that they found some of the metrics used in the presentation difficult to understand. For example, panelists expressed difficulty in interpreting outcomes such as “average” mortality, as they felt the variability of the ESRD patient population was too large for there to be an “average” ESRD patient. They stressed that patient-specific social context is difficult to capture, but integral in understanding health outcomes, as the trends observed in their view are due to the synergistic and additive effects of various socioeconomic factors.

ER Visit Trends

Panelists offered a number of explanations for the trends in ER visits in the ESRD PPS population. They suggested that lack of access to primary care physicians results in chronic illnesses that go unchecked in certain communities, with these patients ending up in the ER. Another panelist cited the fact that some dialysis facilities only offer treatment on a Monday/Wednesday/Friday schedule, and that closure on some days and/or the weekends can negatively affect patients who may need dialysis on these days as well, such as those with CHF, resulting in these patients going to the ER when they need dialysis. Panelists also explained that transportation greatly influenced ER visit practices, noting that those with access to transportation can receive extra treatments to stave off negative outcomes such as CHF, and usually do not end up hospitalized with these outcomes.

Instances of Advantaged Socioeconomic Groups Displaying Poorer Outcomes

Panelists voiced their surprise regarding several instances where socioeconomic groups with characteristics that usually are associated with positive health outcomes exhibited poorer outcomes than disadvantaged groups. These social groups include beneficiaries residing in the least disadvantaged ADI group, and Non-Hispanic Whites, who exhibited lower survival rates and higher adjusted monthly ER visits and hospitalization rates. Acumen explained that when additional covariates were added to the regression, this pattern persisted, and noted that there is a body of epidemiologic literature that also identifies and attempts to explain this phenomenon. One panelist suggested that a large subpopulation of Non-Hispanic White low-income patients may be driving these trends, and suggested that this population be considered for future data collection and research.

Kidney Transplantation

There was also considerable discussion regarding kidney transplant practices. Panelists noted that simply examining instances of transplantation (whether beneficiaries receive transplants or not) lacks the nuance needed to better understand and improve on the entire transplant process. Panelists noted that the process preceding transplants was very complicated, and in their experience patients usually only receive transplants if they are relatively healthy, wealthy, and live close to healthcare facilities. One panelist explained that they observe structural practices that may explain trends in transplantation: transplant clinics being placed in more socioeconomically advantaged communities, while dialysis centers are regularly located in both socioeconomically advantaged and disadvantaged communities. Furthermore, this panelist suggested that ESRD education in communities of color more promptly places patients on a dialysis track, and transplants are less discussed with this population. Another panelist suggested the payment system should be modified to incentivize more equitable kidney transplant practices. One panelist also noted that they experienced transplant facilities' unwillingness to initiate transplant follow-up visits using telehealth, which created a great transplant access barrier for their patients. They suggested that CMS discuss a change with regard to telehealth practice at transplant facilities.

Panelists also suggested that in addition to analyzing completed transplants, the quality of donor transplants received should be reviewed and stratified by patient characteristics. One panelist suggested that the American Indian/Alaska Native and the Black/African American population receive kidneys from living donors at lower rates than other races, and that these patients are receiving expanded criteria donor kidneys, which have poorer graft survival statistics. This panelist also suggested that current practice dictates that those who are healthier usually receive kidney transplants, and suggested that those with comorbidities also should be considered priority candidates for transplantation in order to increase their survival probability. In response, another panelist commented that transplantation to patients performing poorly on dialysis may decrease the availability of transplants for those that are likely to survive for a significant amount of time with the transplant. This panelist also noted that ultimately, it is the decision of the transplant center whether to accept patients for referrals or transplants, thus the metric that should be examined to evaluate access to transplant access by dialysis facilities should be transplant referrals.

2.4.3 Key Findings from Panelist Discussion

- Panelists agreed that geographic isolation, lack of primary care in disadvantaged areas, and lack of transportation influence many adverse health outcomes.
- Panelists shared the sentiment that disparities in kidney transplants persist for a number of reasons, including:

- Transplantation education occurring more frequently in more advantaged areas
- Transplantation centers being largely placed in high-income areas, while dialysis centers are placed in lower income areas
- Black/African American and American Indian/Alaska Natives receiving kidney transplants from living donors at lower rates compared to other races

3 OPEN DISCUSSION: HEALTH EQUITY AND THE ESRD PPS

This section includes a review of the overarching themes related to health equity that emerged in discussion throughout the TEP. Panelists raised a range of issues, from including cost data on special populations not currently identified to making greater use of data on SDOH. They noted that while disparities in health outcomes and treatment patterns were observed in Acumen’s analysis, corresponding disparities in payment accuracy were not observed. Panelists suggested that this might be due to certain costs not being captured through current data collection practices. Panelists also offered suggestions for different models of care delivery that might improve access to care for hard-to-reach populations. They made suggestions for additional payment adjustments to target high-risk patient groups. Panelists understood the potential for improvements in the case-mix, low-volume, and rural payment adjustments to address some of the disparities observed in choice of treatment modality and health outcomes. Panelists were particularly attuned to the need for better data on pediatric dialysis costs. They stressed the need for metrics to assess mental health. They suggested that that new metrics would measure the cumulative effect of patients’ medical conditions on their overall health and well-being. The panelists also commented on topics not directly related to the ESRD PPS, including policies to incentivize kidney transplantation. The discussions that took place on each of these topics are summarized in the following subsections.

3.1 Capturing Hidden Costs

Panelists suggested that the lack of evidence of disparities in payment accuracy might be due to cost report data being insufficiently granular, making it difficult to isolate true costs for certain subsets of patients. Panelists provided examples of costs not currently identified on the cost report, including administrative costs associated with the coordination of care with third parties and additional labor time by nurses completing paperwork. Others explained that while claims collect some costs relating to care for biomedically complex patients, increased facility costs for patients with complex psychosocial needs cannot be documented on traditional claims. One panelist explained that though these costs are important to capture, CMS should consider ways to capture this information without adding provider burden, so as to not exacerbate the unreimbursed work burden for facilities. Another panelist suggested that capturing risk factors as a surrogate for costs may help better understand disparities between costs and outcomes. For example, the collection of hemoglobin A1C data provides information regarding diabetes burden among patients, and because these are resource-intensive patients, this translates to increased costs. Others felt that using risk factors as proxies for costs may not adequately capture the staff time spent on transportation and other tasks needed to assure a patient receives their dialysis treatment. They stated further that tasks often performed by primary care providers and/or family members are often relegated to the dialysis staff or not attended to at all, in which case poor care

coordination, missed treatments and delays in receipt of medical care can result. These panelists suggested that efforts focusing on identifying such unmeasured activities were warranted.

3.2 Social Determinants of Health

Panelists strongly urged that CMS investigate the direct use of SDOH in the case-mix adjustment for the ESRD PPS payment model. Panelists supported an effort to capture more precise data that would reflect the additional costs of treatment for patients with risk factors that make dialysis treatment potentially more difficult. Risk factors that panelists thought were important to capture included housing insecurity, language barriers, lack of transportation, health literacy, and behavioral and mental health issues. Panelists urged CMS to consider the use of validated data collection instruments on SDOH that were administered by social workers or community health workers, who have the skills to address patient hesitancy to disclose personal information. Finally, panelists argued that the interaction of social determinants and health-related risk factors often results in patient care situations requiring more work effort for dialysis facility staff. As an example, one panelist noted that their dialysis facility caseload included patients who were undocumented, homeless, and had mental health issues. As such they suggested that these circumstances should be taken into account in payment models.

Panelists suggested that improved data collection of SDOH at the patient level could be used to effectively identify patients who have a complex blend of risk factors that make them susceptible to health disparities. Panelists noted that facilities located in predominantly Black communities had poorer health outcomes, regardless of whether an individual patient is identified as Black. Panelists recommended that geographic disparities be considered as factors that could have an impact on health outcomes. Another panelist argued, however, that it would be preferable to assess health disparities with the data currently available on SDOH, rather than initiating the collection of additional SDOH data.

3.2.1 *Measuring Area Resources and Deprivation: Metrics and Scales*

Panelists suggested exploring other indices and scales in addition to ADI to measure the combined effects of economic insecurity and social risk factors. They suggested an ideal measurement would include information on the accessibility of healthcare services in specific neighborhoods or census tract groups and multidimensional aspects of an area's socioeconomic conditions. Panelists also wanted to know whether the ADI or other similar measures would be used to direct additional funds to facilities in underserved areas or facilities that serve an especially high proportion of medically complex patients. Acumen also urged the panel to follow up with suggestions for useful indexes and scales that could capture these data.

3.2.2 Collection of Data on Race and Ethnicity

Panelists raised the issue of the intersectionality of race and ethnicity data as currently collected, making the point that there was no way that individuals could identify as belonging to more than one discrete group. They urged CMS to consider options to directly collect more specific data on race and ethnicity, including making more effective use of the 2728 ESRD Medical Evidence Report. They also made the point that there is a subtle interplay between race/ethnicity and neighborhood and community and that it would be important to stratify the ESRD PPS population by a combination of factors that are indicators of social vulnerability.

3.2.3 Housing Insecurity

Housing insecurity was raised by panelists as a factor that affects both healthcare utilization and health outcomes. Panelists pointed out that this variable is not captured on the 2728 ESRD Medical Evidence Report and suggested that it be revised to include such measures. They also noted that housing insecurity presents a barrier to the use of home dialysis, which is a principal goal of the ETC Model.

3.2.4 Patient Populations Not Included in Existing Medicare Data Collection: LGBTQ, Those with Language Barriers, and Those with Low Health Literacy

Panelists queried Acumen about subpopulations currently not included or represented by Medicare data collection measures. These included the LGBTQ community, patients with limited English language proficiency, and patients with low health literacy. Panelists also pointed out that patients with limited English proficiency often comprise a hidden population that face health access barriers and encounter other obstacles. One panelist suggested that payment adjusters for patients at the intersectionality of race and “overlooked populations” should be considered because it requires additional resources to care for such patients. Acumen encouraged panelists to submit their ideas about how these data could be obtained.

3.2.5 Transportation and Accessibility of Facilities and Facility Isolation

Panelists expressed some concern about the use of driving distances as the sole marker for isolation of a facility. They called for some measure of public transportation availability to be used as well. Acumen encouraged the panelists to submit their suggestions for how urban transportation issues and availability of public transportation could be obtained and incorporated into a measure of facility isolation.

Some panelists also noted that geographically isolated facilities are more likely to treat medically complex patients and that those patients are likely to be similarly isolated from ready access to primary care providers. Panelists also pointed out that American Indians/Alaska Natives are at increased vulnerability because they tend to live in more isolated regions. Some

panelists suggested that a payment add-on be considered to compensate dialysis facilities that provide primary care in the absence of local providers. Panelists also noted that increased costs incurred by small and isolated facilities, mostly driven by economies of scale, were exacerbated by a limited number of vendors, which drives up costs of equipment and supplies.

3.3 Pediatric Population

Panelists noted that currently collected data are inadequate to estimate accurately the costs of pediatric dialysis treatment and that these costs are likely underestimated. Currently, other existing medical conditions are not factored into case-mix adjustment for pediatric patients, nor are the costs associated with the type of specialized treatment required by the youngest patients and those with developmental and other disabilities and special needs. Panelists supported the revision of the cost report to include specialized pediatric-related labor categories (e.g., child life specialists, pediatric social workers) and to account for the cost to have on hand a wide array of supplies, reflecting the diversity in the body sizes of pediatric patients and their need for specially designed supplies. Panelists also supported the use of a pediatric-specific modifier, with extensions for age groupings and pediatric-specific comorbidities that bear on the dialysis treatment.

Panelists also noted that the Medicare ESRD PPS pediatric patient population represents only a fraction of the total pediatric dialysis population. They estimate that a significant proportion of the total pediatric dialysis population is not covered by Medicare, but rather is covered by Medicaid or other insurance or may be uninsured. They emphasized their understanding that a large portion of pediatric patients live in poverty and are people of color, who experience an array of health disparities. Panelists felt it was important that CMS not be under the false impression that the Medicare eligible portion of the pediatric population represented the majority of these patients.

3.4 Case-Mix Adjustment

Panelists questioned how the current comorbidities were chosen. Acumen explained that during the construction of the PPS in 2011 and the update in 2016, the contractor prior to Acumen conducted statistical investigations to determine patient characteristics and comorbidities that best predicted variation in dialysis cost. That contractor sought to keep the number of case-mix adjusters to just a few to avoid over-adjusting the model with weak covariates; thus six comorbidities were chosen.¹⁷ In the 2016 update, two comorbidities were removed from the model, resulting in the four currently included.¹⁸ Panelists noted that BSA and

¹⁷ https://kecc.sph.umich.edu/sites/default/files/attachments/publications/UM_KECC_ESRD_Bundle_Report.pdf.

¹⁸ <https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/ESRDpayment/Downloads/ESRD-PPS-Analysis.pdf>

BMI may be correlated and questioned whether both should be used in case-mix adjustment. Acumen noted that the previous contractor explained the rationale for including both as case-mix adjusters in its reports (footnotes 13 and 14). Acumen encouraged panelists to follow up with recommendations for revisions to the case-mix model.

Panelists also provided their thoughts regarding factors they felt were important to include in the case-mix adjustment. One panelist suggested that upper GI bleeds be removed from the present list of comorbidities in favor of coronary artery disease history, diabetes history, and hypertension. Another panelist also suggested that respiratory failure should be considered, due to the frequency with which they see the occurrence of this comorbidity in their practice.

3.5 Other Topics

Several other factors thought to exacerbate disparities in access to and outcomes of dialysis treatment were identified by panelists. Panelists were concerned about disparities in prior treatment and care for CKD and noted that disparities in pre-onset (before kidney failure) care affected the course of dialysis treatment. They urged that data pertaining to pre-ESRD kidney care be collected. They also recommended the use of incentives for CKD and pre-onset care, such as that used in the KCC Model.

Some panelists commented on the health outcomes presented in the TEP. Some, such as ulcers and GI bleeds, were thought not to be as important as others. They suggested that health outcome analyses need to be more “holistic” and focus as much on psychosocial as on biomedical outcomes and to create variables that measured multiple outcomes. Panelists suggested the use of a multiple regression framework for analyzing outcomes. As an example, panelists cited the results presented that showed higher mortality for Non-Hispanic White patients. They felt that more refined statistical adjustment for low income, comorbidities, and other risk factors might well change this result.

Kidney transplantation, while out of the scope of the ESRD PPS, was discussed by the panel. The panel expressed concern about the low rate of transplantation among dialysis patients. Panelists recognized that this was a problem of supply – there are not enough donor kidneys available to meet demand. Panelists also suggested that the use of living donors be further investigated and encouraged. Additionally, panelists expressed concern that patients of color may be more likely to receive poorer-quality kidneys or kidneys from diseased donors. They suggested that CMS collect data on quality of kidneys offered for transplantation. Panelists also maintained that many patients of color are never given the option of transplantation. Panelists agreed that the way waitlists are generated by dialysis facilities and the rate of referrals for transplant should be looked at more closely.

4 CONCLUSION

Acumen continues to assist CMS in its efforts to refine the ESRD PPS with methodological improvements to key components of the payment system. Previous TEPs convened by Acumen in 2018, 2019, and 2020, addressed the technical aspects of these possible methodological refinements. The 2021 TEP, however, was a departure from those held previously, as it focused on examining health disparities experienced by beneficiaries within the setting of the ESRD PPS. While CMS has not endorsed any method or option presented during this TEP, the focus of this TEP is in alignment with CMS and Acumen's goal to develop a statistically robust payment model that also identifies and attempts to remediate health disparities in the ESRD PPS.

Acumen convened a diverse group of stakeholders to serve on this panel to obtain a range of opinions on healthcare inequities that exist in the system. Acumen presented analyses that identified patient populations that experienced disparities in payment accuracy, treatment, and health outcomes that could be measured with currently available data. Panelists contributed important insights on hidden populations at risk for experiencing barriers to access to care and less than optimal healthcare outcomes. Panelists also offered suggestions on the type of information that still must be collected to identify vulnerable patient subpopulations and better address healthcare inequities. Chief among the new types of information panelists urged CMS to collect are measures of SDOH.

This report is being released in tandem with the CY 2023 ESRD PPS NPRM, which includes a Request for Information (RFI) on health disparities in the ESRD PPS. CMS seeks information from the public on possible approaches to collect data on SDOH and other risk factors associated with health inequities. The NPRM encourages the public to provide suggestions for how SDOH and other indicators of potential health disparities can be incorporated into the ESRD PPS to improve the alignment of payment with costs. Public comments received in response to the RFI will be used to inform future rulemaking and policy development.

Other comments on this report may be sent to ESRD-PPS-TEP-Support@acumenllc.com. Please include the topic of your email in the subject line (e.g., Health Equity TEP Report). Acumen also welcomes input related to potential topics for future ESRD PPS TEPs.

APPENDIX: TEP RESULTS

This appendix displays the results presented during the TEP. Analytic results that did not reveal meaningful differences among patient groups and facility types were not displayed during the TEP and are not included here.

Overview of the ESRD PPS

Medicare FFS Patient Demographic Characteristics

| Patient Characteristics | | Fee-for-Service Medicare | |
|---|---|--------------------------|----------|
| | | Non-ESRD PPS | ESRD PPS |
| Overall Patient Count | | 37,391,674 | 402,922 |
| Sex | Female | 53.1% | 41.3% |
| | Male | 46.9% | 58.7% |
| Pediatric | Yes | 0.0% | 0.3% |
| | No | 100.0% | 99.7% |
| Age Category | ≤ 12 | 0.0% | 0.2% |
| | 13-17 | 0.0% | 0.2% |
| | 18-44 | 3.4% | 12.5% |
| | 45-59 | 6.5% | 28.0% |
| | 60-69 | 33.1% | 28.2% |
| | 70-79 | 36.9% | 20.8% |
| | 80+ | 20.1% | 10.1% |
| Original Medicare Entitlement Category | ESRD and Disability | 0% | 29% |
| | ESRD but No Disability | 0% | 24% |
| | Disability Only | 21% | 18% |
| | Age | 79% | 29% |
| Race/Ethnicity* | Non-Hispanic White | 77.4% | 38.9% |
| | Black/African American | 8.9% | 34.5% |
| | Hispanic | 6.9% | 17.1% |
| | Asian/Pacific Islander | 3.3% | 5.0% |
| | American Indian/Alaska Native | 0.6% | 1.6% |
| | Other | 0.9% | 1.2% |
| | Unknown | 2.2% | 1.7% |
| Beneficiary Location | Rural | 20.4% | 16.0% |
| | Urban | 79.6% | 84.0% |
| Part D Coverage | Yes | 61% | 73% |
| | No | 39% | 27% |
| Medicare and Medicaid Benefits Among Part D Enrollees | Dual, Has Premium Subsidy | 15.4% | 42.5% |
| | Non-Dual, Has Premium Subsidy | 2.4% | 6.9% |
| | Non-Dual, No Premium Subsidy | 42.8% | 23.8% |
| National ADI Ranking | 96 to 100 Percentile (Most Disadvantaged) | 3.0% | 6.2% |
| | 76 to 95 Percentile | 16.2% | 22.5% |
| | 26 to 75 Percentile | 52.2% | 49.8% |
| | 6 to 25 Percentile | 20.8% | 16.1% |
| | 1 to 5 Percentile (Least Disadvantaged) | 4.8% | 2.5% |

Data Source: CMS Enrollment Database (EDB); January 2020.

*Data Source for Race/Ethnicity: Research Triangle Institute, Master Beneficiary Summary File (RTI); January 2020.

Part D Enrollment among Medicare FFS ESRD Beneficiaries Stratified by Race/Ethnicity and Socioeconomic Status

| Patient Characteristic | | Fee-For-Service Medicare ESRD | |
|---|---|-------------------------------|----------------|
| | | With Part D | Without Part D |
| Overall Patient Count | | 295,105 | 107,817 |
| Race/Ethnicity* | Non-Hispanic White | 70.0% | 30.0% |
| | Black/African American | 75.9% | 24.1% |
| | Hispanic | 77.2% | 22.8% |
| | Asian/Pacific Islander | 72.8% | 27.2% |
| | American Indian/Alaska Native | 72.3% | 27.7% |
| | Other | 58.3% | 41.7% |
| | Unknown | 67.3% | 32.7% |
| Medicare and Medicaid Benefits Among Part D Enrollees | Dual, Has Premium Subsidy | 58.1% | 0.0% |
| | Non-Dual, Has Premium Subsidy | 9.4% | 0.0% |
| | Non-Dual, No Premium Subsidy | 32.5% | 0.0% |
| National ADI Ranking | 96 to 100 Percentile (Most Disadvantaged) | 6.8% | 4.5% |
| | 76 to 95 Percentile | 23.7% | 19.5% |
| | 26 to 75 Percentile | 48.5% | 53.4% |
| | 6 to 25 Percentile | 15.8% | 17.2% |
| | 1 to 5 Percentile (Least Disadvantaged) | 2.5% | 2.5% |

Data Source: CMS Enrollment Database (EDB); January 2020.

*Data Source for Race/Ethnicity: Research Triangle Institute, Master Beneficiary Summary File (RTI); January 2020.

Payment Accuracy

Payment-to-Cost Ratios: Patient Characteristics

| Patient Characteristics | | Adjusted Mean (Weighted by HD-Equivalent Treatment) | |
|---|---|---|----------------------------------|
| | | Payment-to-Cost Ratio | Total Payment per Treatment (\$) |
| Overall | | 1.00 | 289.18 |
| Sex | Female | 0.99 | 279.31 |
| | Male | 1.01 | 296.80 |
| Age Category* | ≤ 12 | 0.83 | |
| | 13-17 | 0.87 | |
| | 18-44 | 1.13 | |
| | 45-59 | 1.00 | |
| | 60-69 | 0.99 | |
| | 70-79 | 0.94 | |
| | 80+ | 1.01 | |
| Race/Ethnicity | Non-Hispanic White | 0.99 | 286.14 |
| | Black/African American | 1.01 | 298.26 |
| | American Indian/Alaska Native | 1.00 | 279.63 |
| | Hispanic | 1.00 | 284.43 |
| | Asian/Pacific Islander | 0.97 | 278.79 |
| | Other | 0.99 | 286.10 |
| | Unknown | 1.00 | 284.21 |
| Beneficiary Location | Rural | 0.99 | 280.67 |
| | Urban | 1.00 | 290.87 |
| Medicare and Medicaid Benefits Among Part D Enrollees | Dual, Has Premium Subsidy | 0.99 | 289.85 |
| | Non-Dual, Has Premium Subsidy | 1.00 | 288.99 |
| | Non-Dual, No Premium Subsidy | 1.01 | 290.57 |
| National ADI Ranking | 96 to 100 Percentile (Most Disadvantaged) | 0.99 | 273.26 |
| | 76 to 95 Percentile | 0.99 | 275.01 |
| | 26 to 75 Percentile | 1 | 288.45 |
| | 6 to 25 Percentile | 1.03 | 314.04 |
| | 1 to 5 Percentile (Least Disadvantaged) | 1.02 | 339.59 |

Data Sources: 2018-2020 cost report data, 2019 CROWNWeb Clinical Extract data, and 2019 72x claims. HD: hemodialysis.

*Payments per treatment for age categories are not provided because they were not presented during the TEP.

Payment-to-Cost Ratios: Facility Characteristics

| Characteristics | | Adjusted Mean (Weighted by HD-Equivalent Treatment) Payment-to-Cost Ratio |
|---|----------------|---|
| Facility Location | Rural | 0.97 |
| | Urban | 1.01 |
| Low Volume Facilities: LVPA Recipients in 2019 | Yes | 0.91 |
| | No | 1 |
| Facility Size (Annual Treatment Count in 2019) | < 4K | 0.73 |
| | 4K-5K | 0.85 |
| | 5K-10K | 0.94 |
| | 10K+ | 1.04 |
| Driving Distance Between Nearest Facility (Miles) | < 0.5 | 1 |
| | 0.5-2 | 1.01 |
| | 2-5 | 1 |
| | 5-10 | 1 |
| | 10-50 | 0.98 |
| Facility Wage Index | >50 | 0.92 |
| | <0.8 | 0.98 |
| | 0.8-1 | 0.99 |
| | 1-1.2 | 0.98 |
| Facility Ownership Type | ≥ 1.2 | 1.08 |
| | LDO | 1.01 |
| | Regional Chain | 0.94 |
| | Hospital-Based | 0.87 |
| | Independent | 1.01 |

Data Sources: 2018-2020 cost reports, 2019 CROWNWeb Clinical Extract data, and 2019 72x claims. HD: hemodialysis; LDO: Large Dialysis Organization.

Adjusted Average Payment-to-Cost Ratios among Rural Facilities Stratified by National ADI

| Characteristics | | Adjusted Mean (Weighted by HD-Equivalent Treatment) Payment-to-Cost Ratio |
|---|---|---|
| Overall Payment-to-Cost Ratio among Rural Facilities | | 0.97 |
| National ADI Ranking | 96 to 100 Percentile (Most Disadvantaged) | 0.99 |
| | 76 to 95 Percentile | 0.97 |
| | 26 to 75 Percentile | 0.96 |
| | 6 to 25 Percentile | 0.94 |
| | 1 to 5 Percentile (Least Disadvantaged) | 0.84 |

Data Sources: 2018-2020 cost reports, 2019 CROWNWeb Clinical Extract data, and 2019 72x claims. HD: hemodialysis.

**Adjusted Average Payment-to-Cost Ratios among Low-Volume Facilities
Stratified by Race/Ethnicity**

| Characteristics | | Adjusted Mean (Weighted by HD-Equivalent Treatment) Payment-to-Cost Ratio |
|--|--------------------------------|---|
| Overall Payment-to-Cost Ratio among LVPA recipients in 2019 | | 0.91 |
| Race/Ethnicity | Non-Hispanic White | 0.91 |
| | Black/African-American | 0.93 |
| | Hispanic | 0.89 |
| | Asian/Pacific Islander | 0.89 |
| | American Indian/ Alaska Native | 0.81 |
| | Other | 0.91 |
| | Unknown | 0.93 |

Data Sources: 2018-2020 cost reports, 2019 CROWNWeb Clinical Extract data, and 2019 72x claims. HD: hemodialysis.

Treatment Patterns

Adjusted Home Dialysis Utilization by Year (2018-2020)

| Patient Characteristics | | 2018 | 2019 | 2020 |
|---|---|------------|------------|------------|
| Overall | | 11% | 12% | 13% |
| Medicare and Medicaid Benefits Among Part D Enrollees | Dual, Has Premium Subsidy | 8% | 8% | 9% |
| | Non-Dual, Has Premium Subsidy | 11% | 11% | 12% |
| | Non-Dual, No Premium Subsidy | 14% | 15% | 16% |
| National ADI Ranking | 96 to 100 Percentile (Most Disadvantaged) | 8% | 8% | 9% |
| | 76 to 95 Percentile | 10% | 11% | 12% |
| | 26 to 75 Percentile | 12% | 13% | 14% |
| | 6 to 25 Percentile | 10% | 11% | 12% |
| | 1 to 5 Percentile (Least Disadvantaged) | 11% | 11% | 13% |
| Race/Ethnicity | Non-Hispanic White | 14% | 15% | 17% |
| | Black/African American | 8% | 8% | 9% |
| | Hispanic | 9% | 9% | 10% |
| | Asian/Pacific Islander | 12% | 13% | 14% |
| | American Indian/Alaska Native | 8% | 8% | 9% |
| | Other | 11% | 12% | 13% |
| | Unknown | 17% | 17% | 19% |
| Sex | Female | 11% | 12% | 13% |
| | Male | 11% | 11% | 13% |
| Age Category | ≤ 12 | 66% | 60% | 61% |
| | 13-17 | 37% | 38% | 44% |
| | 18-44 | 17% | 17% | 19% |
| | 45-59 | 12% | 13% | 14% |
| | 60-69 | 10% | 11% | 12% |
| | 70-79 | 10% | 10% | 12% |
| | 80+ | 7% | 8% | 9% |
| Original Medicare Entitlement Category | ESRD and Disability | 12% | 12% | 12% |
| | ESRD but no Disability | 13% | 15% | 17% |
| | Disability Only | 8% | 9% | 10% |
| | Age | 10% | 11% | 13% |
| Beneficiary Location | Rural | 13% | 14% | 15% |
| | Urban | 11% | 11% | 12% |

Data Source: 2018-2020 72x claims. Data at patient-month level.

Vascular Access Type Utilization – Adjusted Percentages (2019)

| Patient Characteristics | | Vascular Access Type – Adjusted Percentage | | |
|---|---|--|--------------|--------------|
| | | Catheter | Graft | Fistula |
| Overall | | 16.6% | 17.5% | 64.7% |
| Medicare and Medicaid Benefits Among Part D Enrollees | Dual, Has Premium Subsidy | 17.2% | 18.2% | 63.3% |
| | Non-Dual, Has Premium Subsidy | 15.2% | 17.7% | 65.8% |
| | Non-Dual, No Premium Subsidy | 15.1% | 16.6% | 67.2% |
| National ADI Ranking | 96 to 100 Percentile (Most Disadvantaged) | 16.8% | 19.2% | 62.6% |
| | 76 to 95 Percentile | 16.7% | 18.7% | 63.3% |
| | 26 to 75 Percentile | 16.7% | 17.3% | 64.8% |
| | 6 to 25 Percentile | 16.0% | 15.7% | 67.2% |
| | 1 to 5 Percentile (Least Disadvantaged) | 17.0% | 14.3% | 67.5% |
| Race/Ethnicity | Non-Hispanic White | 19.3% | 14.0% | 66.0% |
| | Black/African American | 15.9% | 24.3% | 58.8% |
| | Hispanic | 14.2% | 14.4% | 70.8% |
| | Asian/Pacific Islander | 13.2% | 17.0% | 69.2% |
| | American Indian/Alaska Native | 12.7% | 9.0% | 78.0% |
| | Other | 15.7% | 17.4% | 66.2% |
| | Unknown | 17.1% | 14.8% | 67.3% |
| Sex | Female | 19.2% | 22.3% | 57.3% |
| | Male | 14.8% | 14.3% | 70.0% |
| Age Category | ≤ 12 | 90.7% | 2.3% | 4.9% |
| | 13-17 | 58.4% | 3.6% | 37.6% |
| | 18-44 | 22.1% | 13.5% | 64.4% |
| | 45-59 | 18.0% | 15.1% | 66.0% |
| | 60-69 | 16.0% | 17.1% | 65.7% |
| | 70-79 | 14.2% | 20.2% | 64.7% |
| | 80+ | 15.8% | 23.4% | 59.9% |
| Original Medicare Entitlement Category | ESRD and Disability | 11.2% | 18.4% | 69.8% |
| | ESRD but no Disability | 14.6% | 18.4% | 66.1% |
| | Disability Only | 20.6% | 17.8% | 60.4% |
| | Age | 21.9% | 16.0% | 61.5% |

Data Source: Hemodialysis lines on 2019 72x claims. Data at patient-month level.

Adjusted Average Treatments per Week (2019)

| Patient Characteristics | | Modality | | |
|---|---|--------------|-------------|-------------|
| | | In-Center HD | Home HD | Home PD |
| Overall | | 2.83 | 3.93 | 6.75 |
| Medicare and Medicaid Benefits Among Part D Enrollees | Dual, Has Premium Subsidy | 2.82 | 3.88 | 6.74 |
| | Non-Dual, Has Premium Subsidy | 2.82 | 3.94 | 6.75 |
| | Non-Dual, No Premium Subsidy | 2.84 | 3.98 | 6.77 |
| National ADI Ranking | 96 to 100 Percentile (Most Disadvantaged) | 2.81 | 4.01 | 6.74 |
| | 76 to 95 Percentile | 2.82 | 3.92 | 6.76 |
| | 26 to 75 Percentile | 2.83 | 3.92 | 6.75 |
| | 6 to 25 Percentile | 2.85 | 3.94 | 6.75 |
| | 1 to 5 Percentile (Least Disadvantaged) | 2.87 | 4.15 | 6.76 |
| Race/Ethnicity | Non-Hispanic White | 2.81 | 3.99 | 6.73 |
| | Black/African American | 2.82 | 3.85 | 6.75 |
| | Hispanic | 2.86 | 3.94 | 6.77 |
| | Asian/Pacific Islander | 2.89 | 4.05 | 6.82 |
| | American Indian/Alaska Native | 2.81 | 3.96 | 6.77 |
| | Other | 2.85 | 3.84 | 6.77 |
| | Unknown | 2.85 | 3.95 | 6.75 |
| Age Category | <=12 | 3.08 | 4.02 | 6.67 |
| | 13-17 | 2.95 | 3.93 | 6.72 |
| | 18-44 | 2.78 | 4.11 | 6.76 |
| | 45-59 | 2.81 | 4.03 | 6.76 |
| | 60-69 | 2.83 | 3.95 | 6.76 |
| | 70-79 | 2.85 | 3.86 | 6.74 |
| | 80+ | 2.85 | 3.67 | 6.72 |

Data Source: 2019 72x claims. Data at patient-month level. HD: hemodialysis; PD: peritoneal dialysis.

Adjusted Percentage with Missed In-Center HD Treatment in a Month (2019)

| Patient Characteristics | | Percent with Missed In-Center HD Treatment |
|---|---|--|
| Overall | | 25% |
| Medicare and Medicaid Benefits Among Part D Enrollees | Dual, Has Premium Subsidy | 28% |
| | Non-Dual, Has Premium Subsidy | 25% |
| | Non-Dual, No Premium Subsidy | 20% |
| National ADI Ranking | 96 to 100 Percentile (Most Disadvantaged) | 27% |
| | 76 to 95 Percentile | 26% |
| | 26 to 75 Percentile | 24% |
| | 6 to 25 Percentile | 23% |
| | 1 to 5 Percentile (Least Disadvantaged) | 22% |
| Race/Ethnicity | Non-Hispanic White | 25% |
| | Black/African American | 27% |
| | Hispanic | 23% |
| | Asian/Pacific Islander | 18% |
| | American Indian/Alaska Native | 30% |
| | Other | 21% |
| | Unknown | 20% |
| Sex | Female | 26% |
| | Male | 24% |
| Age Category | ≤ 12 | 11% |
| | 13-17 | 13% |
| | 18-44 | 26% |
| | 45-59 | 26% |
| | 60-69 | 25% |
| | 70-79 | 24% |
| | 80+ | 23% |
| Beneficiary Location | Rural | 22% |
| | Urban | 25% |

Data Source: In-Center Hemodialysis Treatments on 2019 72x claims. Data at patient-month level. HD: hemodialysis.

Adjusted Average Driving Time in Minutes (2019)

| Patient Characteristics | | Driving Time in Minutes |
|-------------------------|-------------------------------|-------------------------|
| Overall | | 14.4 |
| Race/Ethnicity | Non-Hispanic White | 16.0 |
| | Black/African American | 13.4 |
| | Hispanic | 12.9 |
| | Asian/Pacific Islander | 12.3 |
| | American Indian/Alaska Native | 23.7 |
| | Other | 13.2 |
| | Unknown | 13.3 |
| Age Category | ≤ 12 | 39.2 |
| | 13-17 | 44.9 |
| | 18-44 | 16.0 |
| | 45-59 | 14.7 |
| | 60-69 | 14.1 |
| | 70-79 | 14.0 |
| | 80+ | 13.6 |
| Beneficiary Location | Rural | 22.1 |
| | Urban | 13.0 |

Data Source: In-Center Dialysis Treatments on 2019 72x claims. Data at treatment level.

Adjusted Average MAP Amount (\$) per Treatment (2019)

| Patient Characteristics | | Separately Billable Category | | | | | |
|---|---|------------------------------|---------------|---------------------|----------------|-------------|-------------|
| | | ESA | Calcimimetics | Other Inject. Drugs | Oral Vitamin D | Labs | Supplies |
| Overall | | 23.63 | 27.84 | 3.88 | 0.46 | 6.31 | 0.46 |
| Medicare and Medicaid Benefits Among Part D Enrollees | Dual, Has Premium Subsidy | 24.57 | 28.07 | 4.05 | 0.43 | 6.34 | 0.49 |
| | Non-Dual, Has Premium Subsidy | 22.77 | 30.96 | 3.82 | 0.50 | 6.36 | 0.46 |
| | Non-Dual, No Premium Subsidy | 22.71 | 28.78 | 3.68 | 0.50 | 6.32 | 0.43 |
| National ADI Ranking | 96 to 100 Percentile (Most Disadvantaged) | 23.26 | 26.52 | 4.10 | 0.51 | 6.41 | 0.45 |
| | 76 to 95 Percentile | 22.63 | 26.59 | 3.99 | 0.49 | 6.40 | 0.45 |
| | 26 to 75 Percentile | 23.46 | 27.96 | 3.85 | 0.46 | 6.33 | 0.46 |
| | 6 to 25 Percentile | 25.24 | 29.33 | 3.75 | 0.38 | 6.16 | 0.48 |
| | 1 to 5 Percentile (Least Disadvantaged) | 27.32 | 33.45 | 3.69 | 0.41 | 5.96 | 0.47 |
| Race/Ethnicity | Non-Hispanic White | 23.49 | 23.12 | 3.88 | 0.39 | 6.44 | 0.41 |
| | Black/African American | 24.90 | 37.80 | 4.14 | 0.60 | 6.48 | 0.52 |
| | Hispanic | 21.49 | 20.38 | 3.64 | 0.34 | 5.95 | 0.47 |
| | Asian/Pacific Islander | 22.98 | 23.51 | 3.13 | 0.37 | 5.60 | 0.42 |
| | American Indian/Alaska Native | 23.92 | 14.85 | 3.54 | 0.23 | 5.77 | 0.47 |
| | Other | 22.46 | 25.62 | 3.49 | 0.43 | 5.94 | 0.43 |
| | Unknown | 22.76 | 23.87 | 3.72 | 0.41 | 6.19 | 0.45 |
| Sex | Female | 25.17 | 27.78 | 3.78 | 0.47 | 6.39 | 0.46 |
| | Male | 22.44 | 27.88 | 3.96 | 0.45 | 6.25 | 0.45 |
| Age Category | ≤ 12 | 15.84 | 0 | 2.13 | 1.47 | 5.52 | 0.10 |
| | 13-17 | 24.35 | 1.68 | 3.39 | 2.03 | 6.00 | 0.17 |
| | 18-44 | 27.00 | 29.29 | 4.04 | 0.67 | 6.51 | 0.43 |
| | 45-59 | 24.09 | 29.24 | 3.96 | 0.53 | 6.36 | 0.44 |
| | 60-69 | 23.15 | 26.04 | 3.91 | 0.42 | 6.25 | 0.46 |
| | 70-79 | 22.87 | 28.79 | 3.78 | 0.38 | 6.29 | 0.48 |
| | 80+ | 22.16 | 26.20 | 3.72 | 0.30 | 6.19 | 0.49 |
| Original Medicare Entitlement Category | ESRD and Disability | 22.56 | 38.05 | 3.49 | 0.49 | 6.07 | 0.47 |
| | ESRD but no Disability | 23.57 | 34.72 | 3.60 | 0.48 | 6.14 | 0.46 |
| | Disability Only | 25.35 | 22.57 | 4.30 | 0.42 | 6.58 | 0.47 |
| | Age | 23.59 | 17.44 | 4.16 | 0.43 | 6.47 | 0.44 |
| Beneficiary Location | Rural | 22.22 | 27.13 | 3.75 | 0.51 | 6.05 | 0.41 |
| | Urban | 23.91 | 27.98 | 3.91 | 0.44 | 6.36 | 0.47 |

Data Source: Billable items in 2019 72x claims. Data at patient-month level.

Health Outcomes

Adjusted Survival Probability for Beneficiaries Who Initiated Dialysis in 2019

| Patient Characteristics | | Adjusted Survival Probability at Day N | |
|---|---|--|--------------|
| | | 360 | 720 |
| Overall | | 79.7% | 63.8% |
| Medicare and Medicaid Benefits Among Part D Enrollees | Dual, Has Premium Subsidy | 76.9% | 59.8% |
| | Non-Dual, Has Premium Subsidy | 78.1% | 61.5% |
| | Non-Dual, No Premium Subsidy | 81.3% | 66.4% |
| National ADI Ranking | 96 to 100 Percentile (Most Disadvantaged) | 78.1% | 61.5% |
| | 76 to 95 Percentile | 78.3% | 61.7% |
| | 26 to 75 Percentile | 79.8% | 64.0% |
| | 6 to 25 Percentile | 81.3% | 66.3% |
| | 1 to 5 Percentile (Least Disadvantaged) | 82.7% | 68.4% |
| Race/Ethnicity | Non-Hispanic White | 76.9% | 59.4% |
| | Black/African American | 83.4% | 69.6% |
| | Hispanic | 83.8% | 70.2% |
| | Asian/Pacific Islander | 85.4% | 72.9% |
| | American Indian/Alaska Native | 84.0% | 70.5% |
| | Other | 80.6% | 65.0% |

Adjusted survival probabilities computed using Cox proportional hazards model, using incident ESRD claims in 2019 with a study end date of December 31, 2020.

Overall Adjusted Survival Probabilities 360 Days after Initiating Dialysis - By Facility Characteristics (2019)

| Population | Facility Location | | Low-Volume Facility | | Facility Size (Treatment Count in 2019) | | | |
|------------|-------------------|-------|---------------------|-------|---|-------------|--------------|---------|
| | Rural | Urban | Yes | No | < 4,000 | 4,000-5,000 | 5,000-10,000 | 10,000+ |
| Overall | 78.6% | 79.9% | 78.0% | 79.7% | 77.0% | 77.8% | 78.7% | 80.5% |

Adjusted survival probabilities computed using Cox proportional hazards model, using incident ESRD claims in 2019 with a study end date of December 31, 2020.

ER Visits and Hospitalization Adjusted Rates per Month (2019)

| Patient Characteristics | | ER Visit | Hospitalization |
|---|---|--------------|-----------------|
| Overall | | 19.4% | 12.2% |
| Medicare and Medicaid Benefits Among Part D Enrollees | Dual, Has Premium Subsidy | 21.8% | 13.3% |
| | Non-Dual, Has Premium Subsidy | 19.2% | 12.0% |
| | Non-Dual, No Premium Subsidy | 17.2% | 11.2% |
| National ADI Ranking | 96 to 100 Percentile (Most Disadvantaged) | 20.5% | 12.7% |
| | 76 to 95 Percentile | 20.1% | 12.4% |
| | 26 to 75 Percentile | 19.4% | 12.1% |
| | 6 to 25 Percentile | 18.2% | 12.0% |
| | 1 to 5 Percentile (Least Disadvantaged) | 17.9% | 11.8% |
| Race/Ethnicity | Non-Hispanic White | 20.8% | 13.7% |
| | Black/African American | 19.7% | 11.7% |
| | Hispanic | 18.1% | 11.1% |
| | Asian/Pacific Islander | 14.5% | 9.4% |
| | American Indian/Alaska Native | 16.8% | 11.5% |
| | Other | 17.6% | 11.2% |
| Sex | Female | 21.0% | 12.9% |
| | Male | 18.3% | 11.7% |
| Age Category | ≤12 | 19.4% | 18.7% |
| | 13-17 | 14.6% | 12.3% |
| | 18-44 | 21.9% | 13.1% |
| | 45-59 | 19.3% | 12.0% |
| | 60-69 | 18.3% | 11.8% |
| | 70-79 | 19.2% | 12.2% |
| | 80+ | 20.7% | 12.7% |
| Original Medicare Entitlement Category | ESRD and Disability | 17.1% | 10.3% |
| | ESRD but no Disability | 19.5% | 12.3% |
| | Disability Only | 24.0% | 15.4% |
| | Age | 18.9% | 12.2% |
| Beneficiary Location | Rural | 18.8% | 10.8% |
| | Urban | 19.5% | 12.5% |

Data Sources: 2019 inpatient and outpatient claims for ER visits; 2019 inpatient claims for hospitalizations. Data at patient-month level.

Adjusted Blood Transfusion Rates per Month (2019)

| Patient Characteristics | | Transfusion |
|-------------------------|-------------------------------|-------------|
| Overall | | 2.1% |
| Race/Ethnicity | Non-Hispanic White | 2.2% |
| | Black/African American | 2.2% |
| | Hispanic | 1.7% |
| | Asian/Pacific Islander | 1.8% |
| | American Indian/Alaska Native | 1.5% |
| | Other | 2.1% |
| | Unknown | 1.7% |

Data Sources: 2019 inpatient, outpatient, and carrier claims. Data at patient-month level.

Adjusted Fluid Overload Rates per Month (2019)

| Patient Characteristics | | Fluid Overload |
|-------------------------|---|----------------|
| Overall | | 10.2% |
| National ADI Ranking | 96 to 100 Percentile (Most Disadvantaged) | 10.1% |
| | 76 to 95 Percentile | 9.8% |
| | 26 to 75 Percentile | 10.0% |
| | 6 to 25 Percentile | 11.1% |
| | 1 to 5 Percentile (Least Disadvantaged) | 12.6% |
| Age Category | ≤ 12 | 9.1% |
| | 13-17 | 9.4% |
| | 18-44 | 13.7% |
| | 45-59 | 11.8% |
| | 60-69 | 9.6% |
| | 70-79 | 8.9% |
| Beneficiary Location | 80+ | 8.5% |
| | Rural | 8.8% |
| | Urban | 10.5% |

Data Sources: 2019 inpatient, outpatient, and carrier claims. Data at patient-month level.

Adjusted Hypovolemia Rates per Month (2019)

| Patient Characteristics | | Hypovolemia |
|-------------------------|-------------------------------|-------------|
| Overall | | 0.9% |
| Race/Ethnicity | Non-Hispanic White | 1.0% |
| | Black/African American | 0.8% |
| | Hispanic | 0.7% |
| | Asian/Pacific Islander | 0.7% |
| | American Indian/Alaska Native | 0.7% |
| | Other | 0.8% |
| | Unknown | 0.9% |
| Age Category | ≤ 12 | 2.7% |
| | 13-17 | 1.1% |
| | 18-44 | 1.0% |
| | 45-59 | 0.8% |
| | 60-69 | 0.8% |
| | 70-79 | 0.9% |
| | 80+ | 0.9% |

Data Sources: 2019 inpatient, outpatient, and carrier claims. Data at patient-month level.

Adjusted Congestive Heart Failure Rates per Month (2019)

| Patient Characteristics | | Congestive Heart Failure |
|---|---|--------------------------|
| Overall | | 16.6% |
| Medicare and Medicaid Benefits Among Part D Enrollees | Dual, Has Premium Subsidy | 18.4% |
| | Non-Dual, Has Premium Subsidy | 15.8% |
| | Non-Dual, No Premium Subsidy | 15.2% |
| National ADI Ranking | 96 to 100 Percentile (Most Disadvantaged) | 17.5% |
| | 76 to 95 Percentile | 17.1% |
| | 26 to 75 Percentile | 16.6% |
| | 6 to 25 Percentile | 15.5% |
| | 1 to 5 Percentile (Least Disadvantaged) | 15.4% |
| Race/Ethnicity | Non-Hispanic White | 18.7% |
| | Black/African American | 16.8% |
| | Hispanic | 13.6% |
| | Asian/Pacific Islander | 12.7% |
| | American Indian/Alaska Native | 13.3% |
| | Other | 15.0% |
| | Unknown | 14.4% |

Data Sources: 2019 inpatient, outpatient, and carrier claims. Data at patient-month level.

Adjusted Heart Failure-related Hospitalization Rates per Month (2019)

| Patient Characteristics | | Heart Failure-related Hospitalizations |
|---|-------------------------------|--|
| Overall | | 1.23% |
| Medicare and Medicaid Benefits Among Part D Enrollees | Dual, Has Premium Subsidy | 1.39% |
| | Non-Dual, Has Premium Subsidy | 1.19% |
| | Non-Dual, No Premium Subsidy | 1.07% |
| Race/Ethnicity | Non-Hispanic White | 1.41% |
| | Black/African American | 1.20% |
| | Hispanic | 1.06% |
| | Asian/Pacific Islander | 0.92% |
| | American Indian/Alaska Native | 0.91% |
| | Other | 1.29% |
| | Unknown | 1.02% |

Data Sources: 2019 inpatient claims. Data at patient-month level.

Adjusted Stroke-related Hospitalization Rates per Month (2019)

| Patient Characteristics | Stroke-related Hospitalizations |
|-------------------------|---------------------------------|
| Overall | 0.17% |

Data Sources: 2019 inpatient claims. Data at patient-month level.

Adjusted AMI-related Hospitalization Rates per Month (2019)

| Patient Characteristics | AMI-related Hospitalizations |
|-------------------------|------------------------------|
| Overall | 0.34% |

Data Sources: 2019 inpatient claims. Data at patient-month level.

Adjusted Fracture Rates per Month (2019)

| Patient Characteristics | Fractures | |
|-------------------------|-------------------------------|------|
| Overall | 1.8% | |
| Race/Ethnicity | Non-Hispanic White | 2.4% |
| | Black/African American | 1.2% |
| | Hispanic | 1.8% |
| | Asian/Pacific Islander | 1.3% |
| | American Indian/Alaska Native | 2.4% |
| | Other | 1.8% |
| Sex | Unknown | 1.6% |
| | Female | 2.2% |
| | Male | 1.5% |

Data Sources: 2019 inpatient, outpatient, and carrier claims. Data at patient-month level.

Adjusted Parathyroidectomy Rates per Month (2019)

| Patient Characteristics | Parathyroidectomies |
|-------------------------|---------------------|
| Overall | 0.029% |

Data Sources: 2019 inpatient, outpatient, and carrier claims. Data at patient-month level.

Adjusted Upper Gastrointestinal Bleeding Rates per Month (2019)

| Patient Characteristics | Upper GI Bleeds |
|-------------------------|-----------------|
| Overall | 0.41% |

Data Sources: 2019 inpatient, carrier, and outpatient (non-72x) claims. Data at patient-month level.

Adjusted Ulcer Rates per Month (2019)

| Patient Characteristics | Ulcers |
|-------------------------|--------|
| Overall | 0.81% |

Data Sources: 2019 inpatient, carrier, and outpatient (non-72x) claims. Data at patient-month level.

Adjusted Vascular Access Complication Rates per Month (2019)

| Patient Characteristics | | Vascular Access Complications |
|---|-------------------------------|-------------------------------|
| Overall | | 13.6% |
| Medicare and Medicaid Benefits Among Part D Enrollees | Dual, Has Premium Subsidy | 14.3% |
| | Non-Dual, Has Premium Subsidy | 13.3% |
| | Non-Dual, No Premium Subsidy | 13.2% |
| Race/Ethnicity | Non-Hispanic White | 13.3% |
| | Black/African American | 15.5% |
| | Hispanic | 11.6% |
| | Asian/Pacific Islander | 11.4% |
| | American Indian/Alaska Native | 10.9% |
| | Other | 12.4% |
| | Unknown | 12.4% |

Data Sources: 2019 inpatient, outpatient, and carrier claims. Data at patient-month level.

Adjusted Transplant Rates in 2019

| Patient Characteristics | | Adjusted Transplant |
|---|---|---------------------|
| Medicare and Medicaid Benefits Among Part D Enrollees | Dual, Has Premium Subsidy | 1.2% |
| | Non-Dual, Has Premium Subsidy | 1.6% |
| | Non-Dual, No Premium Subsidy | 2.4% |
| National ADI Ranking | 96 to 100 Percentile (Most Disadvantaged) | 1.1% |
| | 76 to 95 Percentile | 1.3% |
| | 26 to 75 Percentile | 1.8% |
| | 6 to 25 Percentile | 2.1% |
| | 1 to 5 Percentile (Least Disadvantaged) | 2.6% |
| Race/Ethnicity | Non-Hispanic White | 1.7% |
| | Black/African American | 1.5% |
| | Hispanic | 1.7% |
| | Asian/Pacific Islander | 1.9% |
| | American Indian/Alaska Native | 0.9% |
| | Other | 1.7% |
| | Unknown | 2.3% |
| Age Category | ≤ 12 | 21.5% |
| | 13-17 | 19.1% |
| | 18-44 | 6.5% |
| | 45-59 | 3.7% |
| | 60-69 | 2.7% |
| | 70-79 | 1.0% |
| | 80+ | 0.05% |

Data Source: 2019 data in EDB RIC U table