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MEDICAID 1115 DEMONSTRATIONS

Medicaid Section 1115 Demonstrations Summative Evaluation Report

Managed Long-Term Services and Supports

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Andrea Wysocki

Jenna Libersky

Jonathan Gellar

Dean Miller

Su Liu

Margaret Luo

Alena Tourtellotte

Debra Lipson

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ACKNOWLEDGEMENTS

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EXECUTIVE SUMMARY

States are increasingly turning to managed care delivery rather than fee-for-service (FFS) systems to provide long-term services and supports (LTSS) to Medicaid beneficiaries who are older adults or have disabilities. States that use managed care delivery models often do so to improve care quality and control per-person costs for Medicaid beneficiaries with disabilities. As of September 2019, 23 states were operating 33 Medicaid managed LTSS programs (MLTSS),[1] a significant increase from the 8 states that did so in 2004 (Libersky et al. 2018; Saucier et al. 2012). These states operated Medicaid MLTSS programs under numerous federal authorities, including Social Security Act (the "Act") section 1115 demonstrations and programs under a combination of authorities, such as sections 1915(a)/1915(c), 1915(b)/1915(c), 1115/1915(c), or 1932(a)/1915(c) of the Act.[2]

MLTSS programs have the potential to provide less costly, person-centered home- and community-based alternatives to institutional care, improve care quality and coordination, increase quality of life, and reduce the use of unnecessary hospital and institutional services. However, if managed care plans restrict access to services or do not ensure their quality and coordination, MLTSS could have adverse effects on health and long-term care outcomes. As states increasingly deliver LTSS through managed care models, it is important to understand how costs and beneficiary outcomes for MLTSS enrollees differ from those receiving LTSS through traditional FFS delivery systems.

The Centers for Medicare & Medicaid Services (CMS) commissioned Mathematica to evaluate the performance of recent MLTSS programs[3] by examining how Medicaid MLTSS spending changes over time and how beneficiaries enrolled in such programs compare to FFS on their use of specific services, access to such services, quality of care, experience of care, and quality of life.

This report presents results of a summative evaluation conducted between September 2018 and December 2019. This evaluation is Mathematica's second of two outcomes evaluations conducted under the contract; findings from the first round (referred to as the interim evaluation) were published in January 2018 (Libersky et al. 2018).

Research questions and state selection criteria

This summative evaluation addresses five research questions: (1) how does Medicaid MLTSS spending change over time; (2) how does service use compare between MLTSS and FFS

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[1] These counts of MLTSS programs do not include programs provided under the Financial Alignment Initiative (FAI) for Medicare-Medicaid dual enrollees. We exclude the FAI programs throughout this report. They also do not include Rhode Island's Rhody Health Options program because the program ended in September 2018.

[2] This evaluation includes all MLTSS programs that reported reliable data for the study time periods, regardless of the federal authority under which they operate.

[3] MLTSS provided under the FAI for Medicare-Medicaid dual enrollees is being evaluated through a separate contract, which will provide additional findings about costs and beneficiary outcomes for such enrollees in integrated care programs.

systems; (3) how does the quality of care compare between MLTSS and FFS systems; (4) how does self-reported access to care compare between MLTSS and FFS systems; and (5) how does self-reported beneficiary experience and quality of life compare between MLTSS and FFS systems? The data sources and selected states we examined for each domain are as follows:

- For **spending (Question 1)**, we used data from CMS's LTSS Expenditure Reports to present 2017 spending by seven categories of services. We also present total MLTSS spending by state from 2012–2017. To provide context for trends in spending, we also present trends in enrollment from 2012–2017, using both CMS Managed Care Enrollment Reports and state-specific data collected by IBM Watson Health.

- For **service use (Question 2)**, we used Medicaid administrative data from the Medicaid T-MSIS Analytic Files (TAF) from 2014 or 2015 to 2017[4] to compare use of nursing facilities, home- and- community-based services (HCBS), and hospital care among people enrolled in MLTSS programs in three states (Florida, Kansas, Tennessee) to a comparison group of people receiving LTSS under FFS in other states. In two additional states (New Mexico and New York), we examined use of these services among MLTSS beneficiaries alone (that is, without an FFS comparison). We selected MLTSS and FFS states to include in the study based on Medicaid administrative data quality. We limited the study and comparison groups to individuals who were age 21 and older and met the criteria for an institutional level of care. For nursing facility and HCBS use, we calculated separate results for Medicaid-only[5] and dually eligible beneficiaries but calculated measures of hospital care use only for Medicaid-only beneficiaries. [6]

- For **quality of care (Question 3)**, we evaluated a claims-based measure of potentially avoidable hospitalizations just among Medicaid-only beneficiaries. We calculated this measure in the same five states for which we calculated measures of service use, using the same study design (that is, a matched comparison group in Florida, Kansas, and Tennessee, and an unmatched design in New Mexico and New York).

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[4] We calculated outcome measures for 2012 to 2017 using Medicaid Analytic eXtract (MAX) and TAF data; however, we ultimately limited our analysis to time periods that correspond to TAF data (from 2014 or 2015 to 2017) because of concerns about comparing outcomes measures that were constructed with MAX versus TAF data.

[5] Medicaid-only beneficiaries who receive LTSS are individuals who are not eligible for or enrolled in Medicare. For example, this group could include Medicaid-enrolled beneficiaries who are receiving Social Security Disability Insurance (SSDI) benefits and are in the 24-month waiting period for Medicare coverage.

[6] Because dually eligible beneficiaries included in this evaluation receive medical care covered by traditional Medicare FFS or Medicare Advantage (MA) plans, we analyzed medical care outcomes just for Medicaid-only beneficiaries. Although we could obtain Medicare FFS claims data for dually eligible beneficiaries, we could not obtain MA encounter data, meaning we were unable to examine use of medical care for an estimated 32 percent of full benefit dually eligible beneficiaries enrolled in MA plans during most of the period covered by this evaluation (CMS Medicare Medicaid Coordination Office [MMCO] 2018). In addition, because MLTSS plans are not liable for medical services for which Medicare pays for, they have little direct financial incentives or mechanisms to control medical service use for dually eligible beneficiaries.

- For **access to care and beneficiary experience and quality of life (Questions 4 and 5)**, we examined beneficiary responses to 33 items from the National Core Indicators-Aging and Disabilities (NCI-AD) survey reported in 2016–2018. To compare results across the two delivery systems, we pooled data from 18 states that collected survey data in at least one of three available survey waves, including 7 states with MLTSS programs and 14 states that cover institutional services and/or HCBS on a FFS basis.

Findings on spending

In 2017, total enrollment and spending among the 10 MLTSS programs featured in the claims and/or survey analysis (that is, our study states) represented about half of the nation's MLTSS enrollment (53 percent) and a majority of spending (79 percent). Nationwide, both study and non-study states with MLTSS programs spent a greater portion of their total MLTSS expenditures on HCBS than institutional care (68.9 and 56.3 percent, respectively), although there is significant variation across states.

Findings on service use and quality of care outcomes

Among the three states evaluated using a matched comparison group design (our most rigorous method), we found mixed results across programs for all measures and populations[7] with regard to service use outcomes; there was no consistent pattern for MLTSS effects. For nursing facility use, Kansas's program showed lower use for both dual eligible and Medicaid-only MLTSS enrollees compared to FFS beneficiaries. In contrast, in Tennessee, both dual eligible and Medicaid-only MLTSS enrollees had greater use than FFS beneficiaries. In Florida, dual eligibles had lower use but Medicaid-only enrollees had greater use than FFS beneficiaries.

The findings for overall HCBS use were also mixed across programs and populations. In Florida, use of HCBS was higher for dually eligible enrollees and Medicaid-only enrollees in the later years of the analysis relative to FFS beneficiaries. Use was also higher for Medicaid-only enrollees in Kansas relative to FFS beneficiaries. However, use of HCBS was lower for dually eligible enrollees in Kansas and for both populations in Tennessee compared to FFS beneficiaries. Findings for most specific categories of HCBS were mixed across programs, with the exception of home-delivered meals, which showed consistently lower rates of use for MLTSS enrollees than FFS beneficiaries.

For hospital use, Medicaid-only enrollees in Florida and Kansas had a lower number of inpatient days compared to FFS beneficiaries, but Medicaid-only enrollees in Tennessee had more inpatient days compared to FFS beneficiaries. For the quality of care measure—potentially avoidable hospitalizations—MLTSS enrollees in Florida, Kansas, and Tennessee had fewer admissions.

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[7] The samples for each state consisted of mostly dually eligible beneficiaries. The share of dually eligible beneficiaries ranged from about 82 to 94 percent across these study states.

Among the two states for which we show unmatched, descriptive trends, we saw declines in nursing facility and HCBS use in New Mexico but steady use in New York. New Mexico also saw declines in inpatient hospital use and potentially avoidable hospitalizations. We did not calculate these measures for New York. However, because we calculated service use and quality of care measures in isolation (that is, without a matched comparison group), it is difficult to attribute them to MLTSS.

Findings on access to care and beneficiary experience and quality of life

On average, MLTSS enrollees had 28 percent higher odds of responding favorably to questions related to experience of care and quality of life compared to FFS beneficiaries (odds ratio [OR] = 1.28). All 10 domains examined showed more favorable responses among MLTSS enrollees; however, the magnitude was greatest for the domains related to access, control, and relationships (OR = 1.60, 1.35, and 1.36, respectively).

Discussion, limitations, and conclusions

Discussion. Our study found that the effects of MLTSS on nursing facility use, HCBS use, and hospitalizations varied over time and across states and populations—findings consistent with other studies that have evaluated service use and quality of care for MLTSS enrollees. Findings from the interim evaluation for New York and Tennessee were mixed (Libersky et al. 2018); other state-specific evaluations have also found mixed results across a range of outcomes (Grabowski 2006; JEN Associates 2015; Texas Health and Human Services Commission 2017; Deloitte 2017). Mixed findings across states and populations on these measures could be due to myriad factors, including differences in state program design and the level of functional need or other characteristics of enrollees in the study and the comparison states, and data quality problems and difficulty in identifying comparison groups.

Our findings on the effects of MLTSS on access to care or quality of life are consistent with a 2017 survey of Medicaid agency staff who reported on the motivations for MLTSS and its perceived effects (Dobson et al. 2017). The report asserted that the "seamless experience of care" produced by strong care coordination requirements and an enhanced array of services is a primary mechanism for improving quality of life. It also reported that most states use MLTSS programs to expand access to HCBS (Dobson et al. 2017); our findings that measures of access were more favorable among MLTSS enrollees suggest that efforts to expand access have been fruitful.

Limitations. There are a number of limitations to note. For our spending analysis, we set out to examine how MLTSS spending changed over time and how it varied by MLTSS program features. However, we observed several issues with the quality of CMS's LTSS Expenditure Report data; as a result, this evaluation presents only descriptive trends in spending as context for the other claims- and survey-based outcomes.

There were also a number of limitations that affected our evaluation of service use and quality of care outcomes. First, we were able to calculate the claims-based measures of service use and quality of care for only a limited number of MLTSS programs. Second, the findings from the matched repeated cross-sectional (RCS) designs used for Florida, Kansas, and Tennessee do not control for pre-period trends. Although the matched approach controls for national trends that might otherwise affect both MLTSS and FFS states, it does not remove the effect of differences that existed before the start of the programs. Third, for the programs evaluated with a matched design, the populations and services covered in the comparison groups do not align perfectly with their MLTSS counterparts. Because we used out-of-state comparison groups, we are unable to determine whether there were other environmental factors that influenced the outcomes over time that may have influenced differences we observed between the MLTSS states and FFS comparisons within each year. Though our study attempted to control for differences in covered HCBS between MLTSS and FFS comparison states, findings at the HCBS category level may highlight service differences in the breadth of service cover across states, or data identification differences that we were unable to address through our standardized approach to outcome measures across states. Fourth, unobserved characteristics could have influenced the claims-based findings. We cannot rule out that there are unobserved factors between the groups, or that selection bias impacted our findings.

For our survey analysis, we could not control for all differences between MLTSS and FFS populations and programs. Our analysis pooled results across MLTSS and FFS programs, and though we controlled for several demographic, state, and programmatic differences, it is possible that unobserved factors that we did not control for influenced our results. Furthermore, we had to use program-level, not beneficiary-level data, so we were unable to adjust for beneficiary-specific characteristics, such as health or functional status.

Conclusions. All 10 domains we examined for self-reported access, experience, and quality of life showed more favorable responses for MLTSS enrollees compared to FFS beneficiaries. However, for other outcomes we examined, the findings of this evaluation do not demonstrate conclusively that MLTSS has clear benefits over FFS delivery systems in all states and for all LTSS populations. In some states, for some years, and for certain groups of LTSS beneficiaries, there is greater use of HCBS, lower use of nursing homes and hospital days, and fewer potentially avoidable hospitalizations, but the results are inconsistent for reasons that are not entirely clear.

Several improvements in the data are needed to construct a comparable set of measures and outcomes across states for beneficiaries with the same characteristics to provide more conclusive evidence of the effects of MLTSS—operating in different states and for different populations— relative to FFS. The following improvements will provide an opportunity to create the foundation of evidence needed to better understand the impact of MLTSS programs on beneficiary outcomes:

- **Consistent data over longer periods of time.** Rigorous evaluations of MLTSS programs need data sources that are consistent over time to limit the potential for changes in data reporting that affect differences in outcomes across years. They also require consistent and reliable data over many years, both before and after MLTSS implementation. The recent availability of Medicaid TAF data, and improvements to its completeness and reliability over the next several years, might help to address the limitations in data available up until now.

- **Comparable state data on LTSS beneficiaries' characteristics**. To control for differences across states in beneficiary characteristics known to influence the use of HCBS, nursing home admissions, and other key outcomes, it is critical to have information on beneficiaries' functional and cognitive status, as well as living arrangements. The creation of a national database with comparable state data for all FFS LTSS users and MLTSS enrollees remains an elusive goal, not addressed by the recent availability of Medicaid TAF data.

- **Detailed information on specific program features.** Even in rigorous evaluations, differences in outcomes across states and populations may be found—indeed, they can be expected—due to myriad differences in MLTSS program design and operation, MLTSS plan performance, and state and local environments. Understanding how these differences affect key outcomes of MLTSS programs across states and populations requires detailed and comparable information about MLTSS program features and other state and plan initiatives, as well as information about the state and/or local LTSS environment. While some of this information can be collected through various sources, such as program feature information and service coverage from state MLTSS contracts, other information is difficult to obtain or is not readily available for researchers, such as quality improvement initiatives or LTSS provider capacity at the state and/or local levels, and there are no systematic data collection efforts in these areas on the horizon.

Future evaluation work at the state or federal levels depends upon continued progress to address these important data gaps. In addition, as the evidence base on individual MLTSS program effects builds, it is also important to have comparable designs across program-level evaluations to be able to conduct cross-state analyses that can come to broader conclusions about the impacts of MLTSS as a delivery model.

ABBREVIATIONS

ADL	activities of daily living
BIP	Balancing Incentive Program
CCW	Chronic Conditions Data Warehouse
CHIP	Children's Health Insurance Program
CMS	Centers for Medicare & Medicaid Services
D-SNP	Dual Eligible Special Needs Plan
DID	difference-in-differences
ED	emergency department
FAI	Financial Alignment Initiative
FFS	fee-for-service
FIDE-SNP	Fully Integrated Dual Eligible Special Needs Plan
HCBS	home- and community-based services
HSRI	Human Services Research Institute
ICF/IID	intermediate care facility for individuals with intellectual disabilities
ITT	intent-to-treat
LOC	level of care
LTSS	long-term services and supports
MA	Medicare Advantage
MAX	Medicaid Analytic eXtract
MBSF	Medicare Beneficiary Summary File
MLTC	managed long-term care
MLTSS	managed long-term services and supports
MMCO	Medicare Medicaid Coordination Office
NASUAD	National Association of States United for Aging and Disabilities
NCI-AD	National Core Indicators–Aging and Disabilities
OR	odds ratio
PACE	Programs of All-Inclusive Care for the Elderly
PMPM	per-member-per-month
PP	posterior probability

SMMC   Statewide Medicaid Managed Care

TAF   T-MSIS Analytic Files

T-MSIS   Transformed Medicaid Statistical Information System

I. MOTIVATION, PURPOSE, AND RESEARCH QUESTIONS

A. Motivation for evaluating MLTSS programs

States are increasingly turning to managed care delivery systems rather than fee-for-service (FFS) to provide long-term services and supports (LTSS) to Medicaid beneficiaries who are older adults or have disabilities. States that use managed care delivery models, in which the state contracts with private managed care plans to provide LTSS in exchange for a per-member-per-month (PMPM) capitation payment, often do so to improve care quality and control per-person costs for Medicaid beneficiaries with disabilities. As of September 2019, 23 states were operating 33 Medicaid managed LTSS programs (MLTSS),[8] a significant increase from the 8 states that did so in 2004 (Libersky et al. 2018; Saucier et al. 2012). These states operated Medicaid MLTSS programs under numerous federal authorities, including section 1115 demonstrations and programs conducted under a combination of authorities, such as section 1915(a)/1915(c), 1915(b)/1915(c), 1115/1915(c), or 1932(a)/1915(c) authorities.[9]

MLTSS programs have the potential to provide less costly, person-centered home- and community-based alternatives to institutional care, improve care quality and coordination, increase quality of life, and reduce the use of unnecessary hospital and institutional services. However, if managed care plans restrict access to services or do not ensure the quality and coordination of services, MLTSS could have adverse effects on health and long-term care outcomes. As states increasingly deliver LTSS through managed care models, it is important to understand how costs and beneficiary outcomes for MLTSS enrollees differ from those receiving LTSS through traditional FFS delivery systems.

B. Purpose of the evaluation

The Centers for Medicare & Medicaid Services (CMS) commissioned Mathematica to evaluate the performance of recent MLTSS programs[10] by examining how Medicaid MLTSS spending changes over time and how beneficiaries enrolled in MLTSS programs compare to FFS on use of specific services, access to such services, quality of care, experience of care, and quality of life.

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[8] These counts of MLTSS programs do not include programs provided under the Financial Alignment Initiative (FAI) for Medicare-Medicaid dual enrollees. We exclude the FAI programs throughout this report. They also do not include Rhode Island's Rhody Health Options program, which operated between November 2013 and September 2018.

[9] This evaluation examines all MLTSS programs, regardless of the federal authority under which they operate.

[10] MLTSS provided under the FAI for Medicare-Medicaid dual enrollees is being evaluated through a separate contract, which will provide additional findings about costs and beneficiary outcomes for such enrollees in integrated MLTSS programs.

This report presents results of a summative evaluation conducted between September 2018 and December 2019. [11] This evaluation is Mathematica's second of two outcomes evaluations conducted under the contract; findings from the first round (referred to as the interim evaluation) were published in January 2018 (Libersky et al. 2018). The summative evaluation builds on the interim evaluation by:

1. Expanding the number of programs for which we calculate service use outcomes from two (New York's Managed Long-Term Care (MLTC) program and Tennessee's CHOICES program) to five (Table I.1) adding programs in Florida, Kansas, and New Mexico;[12]

2. Expanding the measures of home- and community-based services (HCBS) use and modifying the measures of hospital service use;

3. Adding a quality of care outcome measure related to avoidable hospitalizations; and

4. Using a new data source—the National Core Indicators-Aging and Disabilities (NCI-AD) survey—to examine LTSS beneficiaries' experience of care and quality of life in a pooled analysis of seven MLTSS states.

C. Research questions and methods

Research questions. The goal of this evaluation is to understand how LTSS-related outcomes at the program and beneficiary levels differ between managed care and FFS. Specifically, the evaluation addresses five research questions:

1. How does Medicaid MLTSS spending change over time?

2. How does service use compare between MLTSS and FFS systems?

3. How does the quality of care compare between MLTSS and FFS systems?

4. How does self-reported access to care compare between MLTSS and FFS systems?

5. How does self-reported beneficiary experience and quality of life compare between MLTSS and FFS systems?

Data sources, methods and state selection criteria. Table I.1 summarizes the methods, data sources, and state programs examined for each research question. For spending (Question 1), we use data from CMS's LTSS Expenditure Reports from 2012 to 2017—including unpublished data from CMS's 2017 LTSS Expenditure Report—to , present total MLTSS spending for all MLTSS states with available data. [13] We present spending overall and by seven categories of

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[11] As described in the design report (Wysocki et al. 2019), we had intended to conduct a formal cross-state analysis to summarize findings across MLTSS states and by MLTSS program features, but we were unable to do the cross-state analysis due to the final methodology and states that were able to be included for each state-specific analysis.

[12] In this summative evaluation, we calculated service use outcomes for New York's Medicaid Advantage Plus (MAP) program, but we were unable to evaluate New York's Managed Long -Term Care program.

[13] MLTSS expenditures in these reports were self-reported by states. CMS has noted that there may be issues with data accuracy and completeness for some states for 2017.

services: (1) Medicaid-paid short and long stays in nursing facilities; (2) intermediate care facilities for individuals with intellectual disabilities (ICFs/IID); (3) personal care; (4) home health; (5) HCBS under managed care authorities, such as section 1115 demonstrations, section 1915(b) waivers, section 1915(a) contracts, and section 1932(a) state plan amendments; (6) HCBS under 1915(c) waivers; and (7) other unspecified HCBS. To provide context for trends in spending, we also present trends in enrollment for all MLTSS states from 2012–2017 using both CMS Managed Care Enrollment Reports and state-specific data collected by IBM Watson Health.

For service use (Question 2), we compared use of nursing facilities, HCBS, and hospital care among people enrolled in MLTSS programs in three states (Florida, Kansas, Tennessee; Table I.1) to a comparison group of people receiving LTSS under FFS in other states. In two additional states (New Mexico and New York), we examined use of these services among MLTSS beneficiaries alone (that is, without an FFS comparison). We calculated outcome measures using TAF data from 2014 or 2015 to 2017, therefore choosing study states that included data of sufficient quality to support our evaluation.[14] To ensure that the study and comparison groups had similar functional needs and service use, we limited both groups to individuals who were age 21 and older and met the criteria for an institutional level of care (LOC) based on their health and need for assistance with daily activities.[15] For most measures, we calculated separate results for Medicaid-only and dually eligible beneficiaries; however, we calculated measures of hospital care use only for Medicaid-only. [16]

For quality of care (Question 3), we evaluated a claims-based measure of potentially avoidable hospitalizations among Medicaid-only beneficiaries. We calculated the measure for the same

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[14] As described in Section III and Appendix B, we calculated outcome measures for 2012 to 2017, but we ultimately limited our analysis to time periods that correspond to TAF data (2014 or 2015 to 2017) due to our concerns about comparing outcomes measures that were constructed with MAX data versus TAF data.

[15] All MLTSS programs enroll people with an institutional LOC, but many programs also extend eligibility to those with low or no need for functional support. People with an institutional LOC are all required to demonstrate some level of need for functional support, resulting in a higher probability of needing institutional or community-based LTSS, compared to people with little or no need for functional support. For this reason, this evaluation examines only those who meet institutional LOC in both MLTSS programs and comparison FFS populations. This sample limitation was also needed to identify an appropriate FFS comparison group for the MLTSS enrollees because it would otherwise be difficult to identify an appropriate comparison for MLTSS enrollees with little or no need for functional support who may or may not use any LTSS. CMS does not provide guidance to states on which assessment instruments to use to identify functional needs.

[16] Because dually eligible beneficiaries included in this evaluation receive medical care covered by traditional Medicare FFS or Medicare Advantage (MA) plans, we analyzed medical care outcomes just for Medicaid-only beneficiaries. Although we could obtain Medicare FFS claims data for dually eligible beneficiaries, we could not obtain MA encounter data, meaning we were unable to examine use of medical care for an estimated 32 percent of full benefit dually eligible beneficiaries enrolled in MA plans during most of the period covered by this evaluation (CMS Medicare Medicaid Coordination Office [MMCO] 2018). In addition, because MLTSS plans are not liable for medical services that Medicare pays for, they have little direct financial incentives or mechanisms to control medical service utilization for dually eligible beneficiaries.

subset of MLTSS and FFS comparison states using TAF data, and limited the study population to individuals who were age 21 and older and met criteria for institutional LOC in all states.

Finally, for access to care, and beneficiary experience and quality of life (Questions 4 and 5), we examined beneficiary responses to 33 items from the NCI-AD survey reported in 2016–2018. Survey items fell into 1 of 10 domains, which loosely aligned with our research questions. For example, to assess access, we examined the domains of access and health care. To assess beneficiary experience, we examined survey items in the domains of satisfaction, service coordination, and care coordination. Finally, to assess quality of life, we examined the domains of relationships, safety, rights and respect, everyday living, and control. We pooled data from the seven states that offered one or more MLTSS programs and 14 states with relevant FFS programs that collected data in one or more survey years so we could compare results across the two delivery systems.

Table I.1. Analytic method, data source, and state programs examined, by research question

Analytic method	Data source (year)	MLTSS programs (i.e., some or all LTSS provided under managed care for one or more study years)	FFS states (i.e., some or all LTSS provided under FFS for one or more study years)
Q1: Enrollment and expenditures (results in Section II.C)			
Descriptive trends in enrollment	Managed Care Enrollment Reports and state-specific data collected by IBM Watson (2017)	33 programs across 23 states that provide some or all LTSS under managed care for one or more years of the study	n/a
Descriptive trends in total spending and spending per enrollee	LTSS Expenditure Reports (2012-2017)	(Same as above)	n/a
Q2 and Q3: Service use and quality of care (results in Section III)			
Unmatched, regression-adjusted outcomes	TAF[a] (2014 or 2015-2017)	1. New Mexico Centennial Care 2. New York Medicaid Advantage Plus	n/a
Matched comparison group, regression-adjusted outcomes	TAF[a] (2014 or 2015-2017)	1. Florida Statewide Medicaid Managed Care Long-Term Care Program	South Carolina
		2. Kansas KanCare	Oklahoma
		3. Tennessee CHOICES	Georgia
Q4 and Q5: Access, experience of care, and quality of life (results in Section IV)			
Pooled cross-state analysis of self-reported access, experience, and quality of life	NCI-AD (2016-2018)	1. Delaware Diamond State Health Plan-Plus (DSHP-Plus)[b] 2. Kansas KanCare 3. Minnesota Senior Health Options (MSHO)[b] and Senior Care Plus (MSC+)[b] 4. New Jersey FamilyCare[b] 5. Tennessee CHOICES 6. Texas STAR+PLUS 7. Wisconsin Family Care[b] and Partnership[b]	1. Colorado 2. Delaware[b] 3. Georgia 4. Indiana 5. Maine 6. Minnesota[b] 7. Mississippi 8. Nebraska 9. New Jersey[b] 10. Nevada 11. Ohio 12. Oregon 13. Vermont 14. Wisconsin[b]

FFS = fee-for-service; LTSS = long-term services and supports; MLTSS = managed long-term services and supports; MAX/TAF = Medicaid Analytic eXtract/T-MSIS Analytic Files; NCI-AD = National Core Indicators-Aging and Disabilities survey.

Table I.1 *(continued)*

[a] We limited our analysis to time periods that correspond to TAF data due to concerns about comparing LTSS outcome measures that were constructed with MAX data versus TAF data.

[b] Minnesota and Wisconsin cover LTSS for some populations through MLTSS and others through FFS, while Delaware and New Jersey changed their offerings over time; therefore, the table lists these states are listed as both MLTSS and FFS states.

D. Roadmap to the report

Following this introduction, the report has four additional sections. Section II summarizes findings from previous research on MLTSS, compares features of current MLTSS programs, and presents enrollment and spending trends across MLTSS states. Section III presents findings on claims-based service use and quality of care outcomes for five state MLTSS programs. Section IV presents the results of our analysis comparing NCI-AD beneficiary survey responses on access to care, beneficiary experience, and quality of life between MLTSS enrollees and FFS beneficiaries. Section V puts the findings in context; it summarizes major findings, discusses their relevance and concordance with previous studies, identifies key limitations, and concludes with opportunities for future research.

Detailed information on data sources, methods and supplementary findings is presented in the appendices. Appendix A includes additional information about the enrollment and spending data. Appendix B provides supplemental information about the claims-based outcomes analysis, and Appendix C provides more detail about the NCI-AD analysis.

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II. BACKGROUND ON MLTSS

A. Previous findings on MLTSS effects

Several recent evaluations[17] of state MLTSS programs have found positive effects—lower use of costly services among MLTSS enrollees compared to beneficiaries receiving LTSS through FFS programs. The interim evaluation we conducted before this summative study found that enrollment in New York's Managed Long Term Care program was associated with a lower probability of using both institutional care and hospital services (Libersky et al. 2018). A 2017 evaluation in Texas found that new enrollees in the STAR+PLUS program had lower rates of potentially preventable hospitalizations compared to those remaining in FFS (Texas Health and Human Services Commission 2017). A study of the Massachusetts Senior Care Options program found that its enrollees had fewer months of residence in nursing facilities than a matched FFS group (JEN Associates 2015).

However, not all studies have found positive effects of MLTSS on service use. In contrast to findings in New York, our interim evaluation found that enrollment in Tennessee's CHOICES program increased the probability of using hospital services compared to FFS beneficiaries in two comparison states (Libersky et al. 2018). A study limited to one Massachusetts Senior Care Options plan also found no statistically significant differences in re-hospitalizations among dually eligible beneficiaries enrolled in the program compared to a similar population in FFS (Jung et al. 2015). An evaluation of New Jersey's FamilyCare program found decreases in hospital readmission rates but increases in avoidable emergency department (ED) visits in the first six months of the program (Chakravarty et al. 2016).

Evidence from previous studies on cost savings is also mixed. A review of studies of five MLTSS programs in Arizona, Minnesota, Nevada, Texas, and Wisconsin found that only two (Arizona and Texas) lowered nursing home costs relative to FFS (Grabowski 2006).

B. MLTSS program features across states

The term "MLTSS program" refers to the delivery of LTSS, as defined in 42 CFR § 438.2, through managed care arrangements. Although state MLTSS programs share many common goals, program structure varies widely along several dimensions (Table II.1). These dimensions (including federal authority, populations enrolled, benefits covered, and geographic area served) serve to differentiate multiple programs that exist within a state. Across programs nationwide, these variations can influence outcomes related to access, cost, and quality of care, as described below.

- **Start date.** Some states have been operating MLTSS programs for many years, whereas others have only recently implemented MLTSS programs. Of the 33 MLTSS programs

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[17] The interim evaluation (Libersky et al. 2018) cites additional studies conducted prior to 2017.

operating as of September 2019, 16 have begun since 2012 (see Table II.1).[18] The longer states operate MLTSS programs, the more time plans and providers have to improve quality and reduce costs; however, the pace of improvements may slow over time.

- **Volume of enrollment.** MLTSS programs vary widely in the number of individuals they serve, from just 149 enrolled in Pennsylvania's Adult Community Autism Program as of 2017 to more than 100,000 people enrolled in programs in California, Illinois, New York, and Texas. Whether and how enrollment size affects outcomes is unclear. For example, although larger programs may benefit from economies of scale, smaller programs can tailor care management approaches to the needs of enrollees.

- **Type of enrollment.** Although most programs (24 of 33) require people to enroll in managed care to receive LTSS, 9 programs allow some groups to choose to receive LTSS through managed care (referred to as voluntary opt-in) or automatically assign them to an MLTSS plan from which they can disenroll (referred to as voluntary opt-out). By requiring individuals to enroll in managed care, states can better predict the size of enrollment and the risk that enrollees will use certain services, resulting in more predictable expenditures over time. States also use information on the number and risk of enrollees to develop payment rates that both support the expected cost of the program and attract enough qualified managed care plans to participate (Libersky et al. 2016). More predictable payment rates coupled with greater enrollment—both of which are more likely when enrollment is mandatory–may provide stronger incentives for plans to improve outcomes.

- **Populations enrolled.** Most MLTSS programs cover adults age 65 and over (30 of 33), and many cover adults with physical disabilities (22 of 33) or intellectual disabilities (21 of 33). Only 16 cover children with disabilities. All programs cover full-benefit Medicare-Medicaid dual eligible enrollees for whom Medicare is the primary payer for medical services.[19] Seven programs exclusively enroll those who are dually eligible and offer coordinated services through Medicare Advantage Dual Eligible Special Needs Plans (D-SNPs). Because people age 65 and older (and particularly those age 85 and older) have a higher likelihood of being admitted to a hospital or nursing home, this evaluation adjusts for a number of characteristics, including age, gender, race/ethnicity, urban or rural residence, chronic and disabling health conditions, and other variables reflecting Medicaid eligibility history. In addition, because Medicare covers medical expenses for dually eligible individuals enrolled in MLTSS, programs that enroll a greater proportion of them will have fewer medical

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[18] Counts of programs as of September 2019 exclude Rhode Island's Rhody Health Options program, which operated from November 2013 to September 2018.

[19] Partial-benefit dually eligible beneficiaries do not qualify for full state Medicaid benefits. Depending on household income and assets, Medicaid pays either all or a share of Medicare premiums, deductibles, or cost sharing for these beneficiaries. For more information on categories of dual eligibility, see https://www.cms.gov/MedicareMedicaid-Coordination/Medicare-and-Medicaid-Coordination/Medicare-Medicaid-Coordination-Office/Downloads/MedicareMedicaidEnrolleeCategories_08012018.pdf.

expenses to cover, which influences total expenditures. In this evaluation, we estimate results separately for dually eligible beneficiaries and Medicaid-only individuals.

- **Level of LTSS need.** Although all programs admit people who qualify for an institutional level of care, 19 programs also extend eligibility to those with low or no need for functional support, for example, beneficiaries eligible for Medicare and Medicaid who qualify based on age and income but who do not have a demonstrated need for functional support. Though states vary in their definition of institutional level of care, to meet this standard, individuals are all required to demonstrate some level of need for functional support, which involves help performing activities of daily living (ADL), resulting in a higher probability of using institutional or community-based LTSS compared to programs that enroll individuals with little or no need for functional support. For this reason, this evaluation examines only those who meet institutional level of care in both MLTSS programs and comparison FFS populations.

- **Services covered by capitation.** Most programs (28 of 33) cover both Medicaid medical care and LTSS as part of a comprehensive benefit package for Medicaid-only enrollees;[20] the remaining 5 programs provide LTSS through a limited-benefit managed care program separate from any programs that cover medical care (that is, "carve out" LTSS programs). Of the 32 programs that require MLTSS to cover institutional care, 3 carve out nursing facility stays beyond a certain number of days (180 days in both Minnesota programs and 90 days in Tennessee's ECF CHOICES). The array of services covered in each program influences utilization patterns, as well as MLTSS program spending, both total and per-user. It can also influence beneficiary responses on experience of care; for example, the number of people who report that their services meet all their needs and goals may vary, depending on the services available to them in different delivery systems.

- **Geographic reach of the program.** Most programs (23 of 33) operate statewide; of the 10 programs that do not, 5 cover the most populous county in the state. The size and geographic distribution of each program influenced the comparison strategy used in this evaluation's claims analysis.

These program features highlight key dimensions on which MLTSS programs vary; however, there are many other features that can affect outcomes but are difficult to measure and account for in an evaluation. For example, some MLTSS programs may have integrated systems and formalized procedures for care coordination across medical, behavioral health, LTSS and other important services, which could contribute to better LTSS outcomes. This study attempts to account for some but not all of these features in the claims and survey analyses (see Sections III and IV, and Appendices A and B), but it does not identify nor control for these features in the descriptive analyses of enrollment and spending (Section II.C).

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[20] Approximately three-quarters of Medicaid LTSS users are dually eligible beneficiaries whose acute care is covered by Medicare, either through traditional FFS Medicare, an MA plan, or a special MA plan, such as a D-SNP or Fully Integrated Dual Eligible Special Needs Plan (FIDE-SNP). For more information on D-SNP contracts, see Verdier et al. (2016).

Table II.1. MLTSS program features, as of September 2019

State[a] (N = 23)	Program name (N = 33)	Start date	Federal authority	Mandatory or voluntary enrollment	Target populations				Enrollee type		Minimum LOC needed to enroll	Services covered by capitation	Statewide/Less than statewide
					Children with disabilities	Adults with PD	Adults with I/DD	Older adults 65+	Full dually eligible	Non-dually eligible			
AZ	Arizona Long Term Care System (ALTCS)	1/1/1989	1115(a)	Mandatory	X	X	X	X	X	X	LTSS less than institutional LOC	Medical & LTSS	Statewide
AR	Provider-led Arkansas Shared Savings Entity (PASSE)	3/1/2019	1915(b)	Mandatory	X[b]		X		X	X	For BH: less than institutional LOC for DD: institutional LOC	Medical & LTSS	Statewide
CA	Managed Medi-Cal Long-Term Supports and Services	4/1/2014	1115(a)	Mandatory		X	X	X	X	X	No LTSS need	Medical & LTSS[c]	Less than statewide
CA	Senior Care Action Network (SCAN)	1/1/1996	1115(a)	Voluntary - opt in				X	X		Institutional LOC	Medical & LTSS	Less than statewide[d]
DE	Diamond State Health Plan-Plus (DSHP-Plus)	4/1/2012	1115(a)	Mandatory	X	X	X	X	X	X	No LTSS need	Medical & LTSS[c]	Statewide
FL	Statewide Medicaid Managed Care[e]	8/1/2013	1915(b)/(c)	Mandatory		X		X	X	X	Institutional LOC	Medical & LTSS	Statewide
HI	QUEST Integration[f]	1/1/2015	1115(a)	Mandatory	X	X	X	X	X	X	No LTSS need	Medical & LTSS[c]	Statewide
IA	Iowa Health Link	4/1/2016	1915(b)/(c)	Mandatory	X	X	X	X	X	X	No LTSS need	Medical & LTSS	Statewide

Table II.1 *(continued)*

State[a] (N = 23)	Program name (N = 33)	Start date	Federal authority	Mandatory or voluntary enrollment	Target populations				Enrollee type		Minimum LOC needed to enroll	Services covered by capitation	Statewide/Less than statewide
					Children with disabilities	Adults with PD	Adults with I/DD	Older adults 65+	Full dually eligible	Non-dually eligible			
ID	Medicare-Medicaid Coordinated Plan (MMCP)	7/1/2014	1915(a)/(c)	Voluntary - opt in		X	X	X	X		No LTSS need	Medical & LTSS	Less than statewide
	Medicaid Plus (IMPlus)[g]	11/1/2018	1915(b)/(c)	Mandatory		X	X	X	X		No LTSS need	Medical & LTSS	Less than statewide
IL	HealthChoice[h]	1/1/2018	1915(b)/(c)	Mandatory	X	X	X	X	X	X	No LTSS need	Medical & LTSS[c]	Statewide
KS	KanCare (MLTSS component)	1/1/2013	1115(a)/1915(c)	Mandatory	X	X	X	X	X	X	Institutional LOC	Medical & LTSS[c]	Statewide
MA	Senior Care Options	3/1/2004	1915(a)/(c)	Voluntary - opt in				X	X	X	No LTSS need	Medical & LTSS[c]	Less than statewide[d]
MI	Managed Specialty Services and Supports Program	1/1/1998	1915(b)/(c)	Mandatory	X[i]		X	X	X	X	Institutional LOC	LTSS only[j,k]	Statewide
	MI Choice	10/1/2013	1915(b)/(c)	Mandatory		X		X	X	X	Institutional LOC	LTSS only[k]	Statewide
MN	Minnesota Senior Health Options (MSHO)	2/1/1997	1915(a)/(c)	Voluntary - opt in				X	X		Institutional LOC	Medical & LTSS	Statewide
	Minnesota Senior Care Plus (MSC+)	6/1/2005	1915(b)/(c)	Mandatory				X	X	X	Institutional LOC	Medical & LTSS	Statewide
NC	NC Innovations (MH/DD/SUD waiver)	4/1/2005	1915(b)/(c)	Mandatory			X	X	X	X	Institutional LOC	LTSS Only	Statewide
NJ	NJ FamilyCare (MLTSS component)	7/1/2014	1115(a)	Mandatory	X	X	X	X	X	X	Institutional LOC	Medical & LTSS[c]	Statewide

Table II.1 *(continued)*

State[a] (N = 23)	Program name (N = 33)	Start date	Federal authority	Mandatory or voluntary enrollment	Target populations				Enrollee type		Minimum LOC needed to enroll	Services covered by capitation	Statewide/Less than statewide
					Children with disabilities	Adults with PD	Adults with I/DD	Older adults 65+	Full dually eligible	Non-dually eligible			
NM	Centennial Care (MLTSS component)[l]	1/1/2014	1115(a)	Mandatory	X	X	X	X	X	X	Institutional LOC	Medical & LTSS[c]	Statewide
NY	MLTC Partial Capitation	1/1/1998	1115(a)	Mandatory[m]		X		X	X	X	LTSS less than institutional LOC	LTSS only[c]	Statewide
	Medicaid Advantage Plus	10/1/2007	1115(a)	Voluntary - opt in		X		X	X		Institutional LOC	Medical & LTSS[c]	Less than statewide[d]
OH	MyCare Opt-out[n]	5/1/2014	1915(b)/(c)	Mandatory		X		X	X		No LTSS need	Medical & LTSS[c]	Less than statewide[d]
PA	Adult Community Autism Program (ACAP)	1/1/2009	1915(a)	Voluntary - opt in			X[o]	X	X	X	Institutional LOC	Some Medical[p] & LTSS[q]	Less than statewide
PA	Community HealthChoices	1/1/2018	1915(b)/(c)	Mandatory		X	X[r]	X	X	X	No LTSS need	Medical & LTSS[c]	Statewide
TN	TennCare CHOICES in Long-Term Care	3/1/2010	1115(a)	Mandatory	X[s]	X		X	X	X	LTSS less than institutional LOC	Medical & LTSS[c]	Statewide
	Employment and Community First CHOICES	7/1/2016	1115(a)	Mandatory	X[t]		X	X	X	X	LTSS less than institutional LOC	Medical & LTSS[c]	Statewide
TX	Texas STAR+PLUS	1/1/1998	1115(a)	Mandatory	X[u]	X	X	X	X	X	No LTSS need	Medical & LTSS[c]	Statewide
	Texas STAR Kids	11/1/2016	1115(a)/1915(a)/(c)	Mandatory	X				X	X	No LTSS need	Medical & LTSS[c]	Statewide
	Texas STAR Health	4/1/2008	1915(a)/(c)	Voluntary opt out	X[v]				X	X	No LTSS need	Medical & LTSS[c]	Statewide

Table II.1 *(continued)*

State[a] (N = 23)	Program name (N = 33)	Start date	Federal authority	Mandatory or voluntary enrollment	Target populations				Enrollee type		Minimum LOC needed to enroll	Services covered by capitation	Statewide/Less than statewide
					Children with disabilities	Adults with PD	Adults with I/DD	Older adults 65+	Full dually eligible	Non-dually eligible			
VA	Commonwealth Coordinated Care Plus[w]	8/1/2017	1915(b)/(c)	Mandatory	X	X	X	X	X	X	Institutional LOC	Medical & LTSS[c]	Statewide
WI	Family Care	1/1/1999	1915(b)/(c)	Voluntary - opt in		X	X	X	X	X	LTSS less than institutional LOC	LTSS Only	Statewide
	Family Care Partnership	1/1/1996	1932(a)/1915(c)	Voluntary - opt in		X	X	X	X		Institutional LOC	Medical & LTSS	Less than statewide[d]

Sources: Program features data provided by IBM Watson Health, August 2018; updated by Mathematica, September 2019.

Notes: Information is current as of September 2019. This table does not include MLTSS programs provided under the CMS Medicare-Medicaid Financial Alignment Initiative.

BH = behavioral health; DD = developmental disabilities; HCBS = home- and community-based services; I/DD = intellectual or developmental disabilities; ICF/IDD = Intermediate care facilities for individuals with intellectual disabilities; LOC = level of care; LTSS = long-term services and supports; MLTSS = managed long-term services and supports; N = number; NF = nursing facility; PD = physical disabilities.

[a] Starting in 2013, Rhode Island operated an MLTSS program, Rhody Health Options; however, it is excluded from this table because the program ended September 30, 2018. The program voluntarily enrolled adults with physical or developmental disabilities and older adults, did not require that beneficiaries have an LTSS need, and operated statewide.

[b] Children requiring behavioral health services or services for individuals with developmental disabilities at rehabilitative, intensive, or institutional levels of care.

[c] Program excludes or carves out residential care provided by intermediate care facilities for individuals with intellectual disabilities (ICFs/IID) in one or more service areas.

[d] Includes the most populous counties in the state.

[e] Between August 2013 and November 2018, Florida operated a limited benefit MLTSS program referred to as managed long-term care that covered only LTSS. In December 2018, the state added LTSS to the benefit package of its managed medical assistance (MMA) plans, resulting in a comprehensive MLTSS program.

[f] Hawaii's QUEST Expanded Access program, or QExA, (MLTSS program with 1115 authority that began in 2009) was combined with the QUEST managed care program to cover all Medicaid managed care through one program, QUEST Integration, as of January 2015.

[g] Idaho's mandatory Medicaid Plus (IMPlus) program was developed for dually eligible individuals who do not elect to enroll in the voluntary Medicare-Medicaid Coordinated Plan (MMCP).

[h] As of January 1, 2019, the Integrated Care Program (ICP) (start date of May 1, 2011), Family Health Plan/ACA Adults (FHP/ACA), and Managed Long-Term Services and Supports (MLTSS) (start date July 1, 2016) managed care programs are incorporated in HealthChoice Illinois. ICP mandatorily enrolled adults with physical and developmental disabilities and older adults, and operated in specific counties, whereas the MLTSS program for adults with physical disabilities and older adults operated statewide. For HealthChoice Illinois, all populations are mandatorily enrolled and the program operates statewide.

Table II.1 *(continued)*

[i] Children with serious emotional disturbance (SED) and/or DD.

[j] Michigan's Specialty Services and Supports Program covers mental health and substance use disorder services, and LTSS for all Medicaid beneficiaries with mental illnesses, substance use disorders, or DD through county-based prepaid inpatient health plans (PIHPs). According to data collected by CMS in 2017, only 7,634 of the total 2,286,950 enrollees use LTSS. Because the program predominantly serves non-MLTSS users, we did not consider the program for inclusion in our evaluation; however, it is included in total managed LTSS expenditures.

[k] Program includes HCBS only (NF and ICF/IID are carved out).

[l] New Mexico's CoLTS mandatory MLTSS program (1915b/1915c authority) began in 2008. In January 2014, New Mexico consolidated the administration of CoLTS and its managed care program Salud! through a new 1115 demonstration referred to as Centennial Care. The new program covers behavioral health benefits for MLTSS enrollees, whereas the previous MLTSS program provided behavioral health benefits through a separate behavioral health managed care program.

[m] Populations enrolled mandatorily for New York's MLTC program include dually eligible individuals over age 21 who need community-based long-term care services for more than 120 days and individuals residing in the counties of NYC, Nassau, Suffolk, or Westchester. Populations enrolled voluntarily include dually eligible individuals ages 18–21 who need community-based long-term care services for more than 120 days and are nursing home eligible and non-dually eligible individuals over age 18 who are nursing home eligible.

[n] Ohio requires that dually eligible beneficiaries enroll in one of two service options, both referred to as MyCare: (1) an FAI demonstration that integrates Medicare and Medicaid benefits through Medicare-Medicaid plans or (2) an MLTSS program for beneficiaries who opt out of the FAI demonstration that provides LTSS through non-integrated managed care plans. This table presents information on the MLTSS opt-out program only.

[o] Must have a diagnosis of Autism Spectrum Disorder.

[p] Program excludes inpatient facility, ambulatory surgical center, clinic services, family planning, renal dialysis center, laboratory, x-ray clinic, and pharmacy services.

[q] Program excludes home health care and transportation services.

[r] People who receive waiver or other services from the Office of Developmental Programs are excluded, but other dually eligible beneficiaries with I/DD are included.

[s] Children in nursing homes only.

[t] Children with I/DD.

[u] This group is not mandatory.

[v] Texas's STAR Health program enrolls children associated with the foster care system who may or may not have disabilities.

[w] Virginia's Commonwealth Coordinated Care Initiative was the state's FAI program, which began in 2013 (1932a/1915c authority) and phased out as a new MLTSS program was phased in; in 2017, the state began operating the current MLTSS program: Commonwealth Coordinated Care Plus. All FAI beneficiaries were transitioned to the current, now statewide program by January 1, 2018.

C. MLTSS enrollment and spending trends

In addition to variation in their design features, MLTSS programs vary in size and cost over time. This section compares MLTSS enrollment trends and total spending for the states featured in the evaluation to each other and to all states that operate MLTSS programs. It presents results for states included in the claims analysis (Florida, Kansas, New Mexico, New York, and Tennessee) separate from those included in the survey analysis (Delaware, Kansas, Minnesota, New Jersey, Tennessee, Texas, and Wisconsin) or neither. Understanding the similarities and differences among the study and non-study states can help in assessing the extent to which the results of this evaluation are representative of all states with MLTSS.

1. Enrollment trends

Between 2004 and 2017, the number of people using MLTSS nationally increased more than tenfold, from 105,924 to 1,217,169 (Table II.2). About half of this enrollment growth (48 percent) occurred in the 8 states that operated MLTSS as of 2004, many of which expanded existing programs to new populations or geographic regions, or implemented additional programs after 2004. The remaining growth occurred in 15 states that launched MLTSS programs after 2004. Seven of these states began MLTSS programs between 2004 and 2012 (resulting in 33 percent of total enrollment growth from 2004 and 2017); another 8 began MLTSS between 2013 and 2017 (19 percent total growth).[21]

Table II.2. MLTSS users or enrollees, 2004 and 2012–2017

State	2004[a]	2012[a]	2013[b,c]	2014[b,d]	2015[b,e]	2016[b,f]	2017[b,g]
Total users or enrollees[h]	**105,824**	**388,977**	**912,494**	**1,450,671**	**1,024,520**	**1,224,351**	**1,299,189**
Total MLTSS users	105,924	389,390	356,281	358,061	870,023	1,081,469	1,217,169
Included in study	**33,371**	**265,963**	**741,141**	**802,263**	**573,441**	**655,806**	**682,313**
Claims analysis only	**10,148**	**89,021**	**166,741**	**236,511**	**252,200**	**285,720**	**320,250**
Florida[i]	3,070	19,283	20,713	83,289	87,591	92,350	97,638
New Mexico[i]	-	22,446	40,465	25,749	29,058	30,191	30,235
New York[i,j]	7,078	47,292	105,563	127,473	135,551	163,179	192,377
Survey analysis only	**23,223**	**145,742**	**492,095**	**504,115**	**259,010**	**312,838**	**308,085**
Delaware	-	4,800	10,922	6,114	12,955	12,452	12,892
Minnesota	3,910	32,693	32,523	32,457	33,242	32,560	32,491
New Jersey	-	-	0	11,345	18,221	28,810	37,209
Texas	10,671	71,239	408,808	413,414	151,214	192,445	176,432
Wisconsin[i,j]	8,642	37,010	39,842	40,785	43,378	46,571	49,061
Claims and survey analyses	**0**	**31,200**	**82,305**	**61,637**	**62,231**	**57,248**	**53,978**

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[21] Virginia is excluded from enrollment growth calculations because it began its MLTSS program August 1, 2017 and therefore did not report enrollment counts as part of the Medicaid Managed Care Enrollment Report data collection for 2017.

Table II.2 *(continued)*

State	2004[a]	2012[a]	2013[b,c]	2014[b,d]	2015[b,e]	2016[b,f]	2017[b,g]
Kansas	-	0	21,362	30,484	31,898	30,428	29,287
Tennessee[i,k]	-	31,200	60,943	31,153	30,333	26,820	24,691
Not in study	**72,453**	**123,014**	**171,353**	**648,408**	**451,079**	**568,545**	**616,876**
Arizona	39,512	52,251	51,260	52,936	54,631	56,278	58,003
California	-	2,304	7,655	510,938	272,648	317,693	325,355
Hawaii[l]	-	6,830	45,997	8,607	8,663	9,132	4,470
Idaho	-	-	-	0	1,635	2,326	2,289
Illinois	-	-	38,098	23,884	34,202	35,177	63,364
Iowa	-	-	-	-	-	40,280	41,229
Massachusetts[m]	100	15,568	28,212	22,827	42,718	47,253	54,345
Michigan	32,841	41,272	NR	17,707	18,468	19,120	19,062
North Carolina	-	4,699	NR	NR	NR	NR	NR
Ohio	-	-	-	NR	NR	40,709	45,135
Pennsylvania	-	90	131	9	0	0	149
Rhode Island	-	-	0	11,500	18,114	577	3,475
Virginia	-	-	-	-	-	-	0

"-" denotes a year in which the MLTSS program did not exist in the state. "0" denotes a year in which an MLTSS program was in place, but enrollment as of the collection date was zero. "NR" denotes a year in which the state could not report MLTSS users/enrollees; states reporting "NR" are not included in the MLTSS user/enrollee total for the year. Data used for this table were current as of Fall 2019.

CMS = Centers for Medicare & Medicaid Services; HCBS = home and community-based services; LTSS = long-term services and supports; MLTSS = managed long-term services and supports; NR = not reported.

[a] Source: Saucier et al. 2012.

[b] Source: CMS Medicaid managed care enrollment reports: 2013–2016 (corrected), 2017 (unpublished and obtained from CMS in Fall 2019). Enrollment is reported as of July 1 of the year.

[c] In 2013, the following states were able to report MLTSS enrollees only and are therefore excluded from the calculation of total LTSS users: Hawaii (45,997 enrollees), New Mexico (40,465 enrollees), Tennessee (60,493 enrollees), and Texas (408,808 enrollees). Michigan and North Carolina also are excluded for this period because they did not provide counts of MLTSS users for this data collection, although both had programs providing some 1915(c) waiver services through managed care during the reporting year.

[d] In 2014, the following states were able to report MLTSS enrollees only and are therefore excluded from the calculation of total LTSS users: California (510,938 enrollees) and Texas (413,414 enrollees). Michigan is excluded because it did not provide counts of MLTSS users for this data collection, although it provided some 1915(c) waiver services through managed care during the reporting year. Ohio is also excluded because it did not report MLTSS users in this data collection, though its MLTSS program (and companion FAI demonstration) has operated since 2014.

[e] In 2015, the following states were able to report MLTSS enrollees only and are therefore excluded from the calculation of total LTSS users: Delaware (12,955 enrollees), Florida (87,591), Idaho (1,635), Illinois (34,202), and Rhode Island (18,114 enrollees).

[f] In 2016, the following states were able to report MLTSS enrollees only and are therefore excluded from the calculation of total LTSS users: Delaware (12,452 enrollees), Florida (92,350 enrollees), Idaho (2,326 enrollees), Illinois (35,177 enrollees), and Rhode Island (5,139 enrollees).

[g] In 2017, the following states were able to report MLTSS enrollees only and are therefore excluded from the calculation of total LTSS users: Delaware (12,892 enrollees) and Rhode Island (3,475 enrollees).

Table II.2 *(continued)*

beneficiaries who might be at risk of needing LTSS but do not receive any. States vary in their ability to report users accurately across years; therefore, trends across years should be interpreted cautiously.

[i] Florida, New Mexico, New York, Tennessee, and Wisconsin reported enrollees rather than users in one or more years; however, because these states required MLTSS enrollees to meet a nursing facility level of care or another lower level of need for services, it is likely that all enrollees use some LTSS, so the counts of enrollees are likely to be equivalent to the count of users.

[j] New York and Wisconsin operate comprehensive and limited-benefit MLTSS programs. In each state, the number of MLTSS users reported in each year is the sum of users reported for both program types.

[k] CMS Medicaid managed care enrollment reports from 2013 reported that Tennessee enrolled 60,943, but the Division of TennCare reported that the number of persons receiving HCBS and nursing facility services as of June 30, 2013 was 31,974 (Division of TennCare 2020). The number reported to CMS is reported in the total counts of MLTSS enrollees.

[l] Correspondence between Mathematica and Hawaii conducted as part of 2018 Medicaid managed care enrollment data collection suggested Hawaii changed its method of identifying and reporting LTSS users between 2016 and 2017.

[m] CMS Medicaid managed care enrollment reports from 2017 reported that Massachusetts enrolled 42,718 MLTSS users in 2015, but Health Management Associates reported the actual number of MLTSS users that year as 25,750. Nevertheless, the number reported to CMS is included in the total counts of MLTSS users (see Health Management Associates 2016).

In 2017, the number of users or enrollees in MLTSS programs featured in this study was roughly similar to the number in programs not included (633,252 compared to 665,937); however, the two sets of MLTSS states experienced different enrollment trends in earlier years. In 2012, there were more users or enrollees in MLTSS programs featured in our study than in non-study states (228,953 compared to 160,024; Figure II.1). One reason is that a greater proportion of MLTSS programs featured in the study started in 2012 or earlier (7 of 9; 78 percent), compared to MLTSS programs not featured in the study (8 of 14 started before 2012, or 57 percent), giving the former more time to reach maturity or expand statewide. From 2012-2015 (data not shown), the number of users or enrollees in MLTSS study states remained higher than that of non-study states, resulting from sizeable program expansions in Florida, New York, and Texas, and a new program in New Jersey. Beginning in 2016 (data not shown), however, the total number of enrollees or users in the MLTSS study states fell below that of the non-study states due to the combination of: new enrollment in Iowa, expanded enrollment in California, newly reported enrollment in Ohio, and declining enrollment in Tennessee and Texas.

Figure II.1. MLTSS users or enrollees in study and non-study states in 2012 and 2017
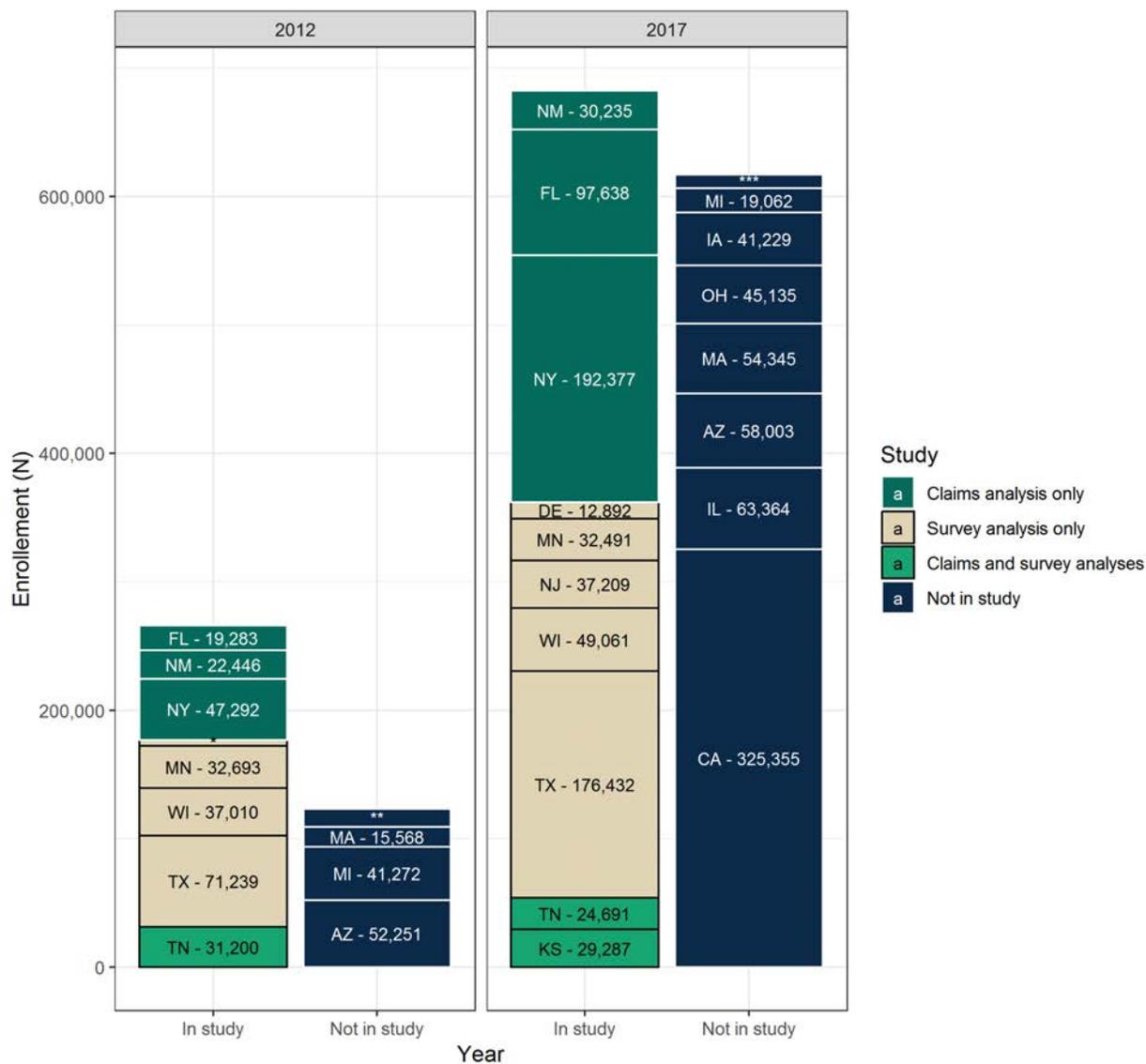
* DE - 4,800
** HI - 6,830; NC - 4,699; CA - 2,304; PA - 90
*** HI - 4,470; RI - 3,475; ID - 2,289; PA - 149

MLTSS = managed long-term services and supports; N = number.

2. Expenditure trends

The rise in the number of MLTSS enrollees has been accompanied by a rise in total MLTSS expenditures. By 2017, among states that could report the data, total MLTSS expenditures reached nearly $38 billion, up from less than $9 billion in 2012 (Table A.1). The increase in spending is the result of expanded enrollment and services; by 2017, MLTSS represented 23 percent of total LTSS spending nationwide, up from 6 percent in 2012 (Table A.1). MLTSS states included in this study represent a sizable portion of total MLTSS spending nationally

throughout 2012–2017; however, we cannot calculate exact proportions for each year due to data omissions in several states.

Each year, total MLTSS expenditures comprise spending on institutional and HCBS service categories. LTSS system rebalancing, which means tipping the spending balance in favor of HCBS, is a goal for many states. In 2017, the proportion of total MLTSS expenditures for HCBS versus institutional long-term care was relatively similar among MLTSS states included in the study and those not included (67.7 percent HCBS among MLTSS study states versus 62.2 among non-study states).

The range of spending on HCBS versus institutional care, however, varied widely within each group (Table II.3). For example, among the states featured in the claims analysis, in 2017, Florida spent only 21.9 percent of total MLTSS on HCBS, whereas New York spent 87.6 percent. Among the states featured in the survey analysis, New Jersey spent 36.1 percent of total MLTSS on HCBS, whereas Minnesota spent 88.3 percent in 2017. Though the proportion of total MLTSS spending used for HCBS provides some indication of a state's progress toward rebalancing care in favor of HCBS, spending totals in each category mask differences in the number and type of functional needs of MLTSS enrollees in each state, and the type and cost of services they use. For this reason, as well as limitations in national-level MLTSS enrollment and expenditure data, unadjusted spending trends across states are not comparable.

Table II.3. MLTSS expenditures by category, FY 2017[a]

State	Total expenditures (in thousands of dollars)	Total managed ILTC[f] (%)	Total managed HCBS[f,g] (%)	Managed ILTC expenditure categories, as a percentage of total[e]		Managed HCBS expenditure categories, as a percentage of total[f]				
				Nursing facility (%)	ICF/IID[h] (%)	Personal care (%)	Home health (%)	Community First Choice (%)	HCBS under 1915(c) waivers[g] (%)	HCBS (unspec-ified) (%)
Total[b]	37,809,612	33.6	66.4	31.5	2.1	16.7	2.1	15.1	12.2	20.3
Included in study[c,d]	**30,246,560**	**31.1**	**68.9**	**30.5**	**0.6**	**20.8**	**1.7**	**18.9**	**7.9**	**19.5**
Claims analysis	**18,526,783**	**26.3**	**73.7**	**26.3**	**0.0**	**28.6**	**1.3**	**25.8**	**4.4**	**13.7**
Florida	3,699,893	78.1	21.9	78.1	-	-	-		21.9	-
New Mexico	591,612	36.3	63.7	36.3	-	-	-		-	63.7
New York	14,235,278	12.4	87.6	12.4	-	37.2	1.7	33.5	-	15.2
Survey analysis	**10,136,850**	**34.3**	**65.7**	**34.3**	**0.0**	**9.9**	**0.7**	**9.3**	**15.7**	**30.2**
Delaware	523,812	51.0	49.0	51.0	-	6.7	7.7		-	34.7
Minnesota	569,346	11.7	88.3	11.7	-	22.9	1.9		63.5	-
New Jersey	1,122,455	63.9	36.1	63.9	-	-	-		-	36.1
Texas	6,278,637	35.9	64.1	35.9	-	9.7	-	15.0	-	39.4
Wisconsin	1,642,600	10.3	89.7	10.3	-	13.9	1.0		74.8	-
Claims and survey analyses[c,d]	**1,582,927**	**67.7**	**32.3**	**56.4**	**11.3**	**0.0**	**13.3**	**0.0**	**0.0**	**19.0**
Tennessee[d]	1,582,927	67.7	32.3	56.4	11.3	-	13.3	-	-	19.0
Not in study[c]	**7,563,052**	**43.7**	**56.3**	**35.5**	**8.2**	**0.1**	**3.6**	**0.0**	**29.2**	**23.5**
Arizona	1,813,802	25.7	74.3	23.9	1.9	-	3.3		-	71.0
Hawaii	401,061	73.7	26.3	73.7	-	-	0.9		-	25.4
Idaho	17,997	30.0	70.0	30.0	-	25.1	10.2		34.7	-
Illinois	363,415	77.9	22.1	77.9	-	-	21.4		0.7	-
Michigan[e]	811,884	-	100.0	-	-	-	3.7		96.3	-
North Carolina[f]	1,253,462	46.6	53.4	-	46.6	-	-		53.4	-
Ohio	2,276,431	63.0	37.0	63.0	-	-	4.3		32.7	-
Rhode Island	625,000	37.9	62.1	37.9	-	-	-		-	62.1

"-" indicates that no expenditure was reported for the category.

FY = fiscal year; HCBS = home- and community-based services; ICF/IID = intermediate care facilities for individuals with intellectual disabilities; ILTC = institutional long-term care; MCA = managed care authorities, such as section 1115 demonstrations, section 1915(b) waivers, section 1915(a) contracts, and section 1932(a) state plan amendments.

Table II.3 *(continued)*

[a] Source: Unpublished data obtained from CMS in Fall 2019. MLTSS expenditures were self-reported by states. CMS has noted that there may be issues with data accuracy and completeness for some states. Data used for this table were current as of Fall 2019.

[b] Totals are calculated from states reported in this table; they include MLTSS expenditures but not those for Programs of All-Inclusive Care for the Elderly (PACE). Excluded from this table are (1) states whose only MLTSS program model is PACE (Alabama, Arkansas, Colorado, Indiana, Louisiana, Maryland, Missouri, Nebraska, New Hampshire, North Dakota, Oklahoma, Oregon, and Wyoming) and (2) states that provide MLTSS only through a capitated FAI demonstration (South Carolina and Washington).

[c] This table does not include data for California, Iowa, Kansas, Massachusetts, Pennsylvania, and Virginia, which did not report complete MLTSS expenditures in 2017. Kansas is featured in the claims and survey analyses; all other states are not included in the study.

[d] Correspondence between Mathematica and Tennessee program officials suggests ICF-IDD spending is inaccurate, since Tennessee does not cover ICF-IDD through any of its MLTSS programs. Excluding ICF-IDD spending from the total MLTSS spending in Tennessee yields 63.6 percent on institutional care and 36.4 percent on HCBS.

[e] Michigan, North Carolina, and Pennsylvania operate specialty MLTSS programs that cover a limited range of HCBS under capitation. Specifically, Michigan carves out institutional services from its MLTSS programs and therefore does not report expenditures for managed ILTC. North Carolina provides state plan institutional services and HCBS for people with I/DD, and therefore reports institutional expenditures only for ICF/IID. Pennsylvania, which operates a comprehensive program that provides institutional services and HCBS for adults with autism, did not report complete MLTSS expenditures for 2017; therefore, it is excluded from this table (see footnote a).

[f] Some state data are based on a different time period than the federal fiscal year. Data for Hawaii, New Jersey, North Carolina, Rhode Island, and Texas are estimates for the state fiscal year.

[g] Illinois managed care data are incomplete for Medicare/Medicaid dual eligible program enrollees.

[h] Source documents suggest that data do not include expenditures for managed care programs in Wisconsin.

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III. ANALYSIS OF SERVICE USE AND QUALITY OF CARE OUTCOMES IN FIVE MLTSS PROGRAMS

In this section, we describe our approach and findings for research Questions 2 and 3, which address how service use and quality of care compare between MLTSS and FFS systems.[22]

A. Study hypotheses

We hypothesized that MLTSS enrollees will have (1) greater HCBS and less nursing facility use and (2) less acute care use, compared to FFS LTSS users. We would expect MLTSS enrollees to have greater HCBS use and less nursing facility use because, in contrast to a FFS system, MLTSS plans are accountable for all LTSS costs for enrollees and thus have an incentive to reduce the use of more costly nursing facility care to provide all covered benefits and cover administrative costs (and profit margin in for-profit plans) within the capitated monthly payment amount. MLTSS plans may also have greater ability to ensure access to services such as HCBS by directing enrollees to in-network providers, whereas FFS enrollees may have more difficulty in obtaining all needed HCBS if their usual care managers cannot provide personalized attention or not enough of the right type of providers are available when needed. Comprehensive MLTSS plans (which encompass all five MLTSS programs included in this component of the evaluation) also have an incentive to reduce costly acute care use for Medicaid-only enrollees because the plans are responsible for covering such costs. In addition, states can more easily hold plans accountable for outcomes such as potentially avoidable hospitalizations, relative to FFS programs.

B. Data

1. Data sources

To construct our samples and outcome measures related to LTSS and hospital service use, we used a combination of data from national Medicaid and Medicare administrative data sources:

- **Medicaid:** To enhance comparability of data across states, we relied on national Medicaid administrative data from TAF from 2014–2017.[23] For some states, we also obtained finder files from state Medicaid agencies to help identify MLTSS enrollees in the national administrative data or limit the MLTSS enrollees to those who met criteria for an institutional

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[22] This section presents MLTSS program-level estimates. As described in the evaluation design report (Wysocki et al. 2019), we had also intended to conduct a cross-state analysis to understand the relationship between MLTSS program features and MLTSS impacts. Because we were unable to use a rigorous difference-in-differences (DID) approach for any program in our evaluation, we were unable to run a cross-state analysis. We provide more details about the design framework and approach in Appendix B.

[23] As described in this section and Appendix B, we initially intended to evaluate 2012–2017 across states, using 2011 data for look-back periods. These time periods required Medicaid Analytic eXtract (MAX), Alpha-MAX, and TAF data. However, we ultimately limited our outcomes analysis to time periods that corresponded to TAF data due to inconsistencies in the outcome measures over time across data sources. These time periods start in 2014 or 2015 but the exact date varies by state (Table III.1).

LOC. The specific data sources for each program and study year are detailed in Appendix B. The data used for our analysis were current as of Fall 2019.

- **Medicare:** For dually eligible beneficiaries in our sample, we also used Medicare administrative data to identify additional beneficiary characteristics for matching and covariates in our models. Specifically, we used the Medicare Beneficiary Summary File (MBSF) Base, Chronic Conditions Segment, and Other Chronic or Potentially Disabling Conditions Segment from 2014–2017.

2. Medicaid administrative data quality

Approach. To determine which states could be included in the evaluation of service use and quality of care outcomes, we assessed each state's Medicaid administrative data quality by source and study year. We focused our checks on whether the data would allow us to identify (1) MLTSS enrollees who meet an institutional LOC, (2) FFS 1915(c) waiver enrollees, and (3) claims and encounters for LTSS among enrolled populations. Because service use for LTSS covered under managed care is contained in encounter records, which historically have been poorly reported by states (Byrd and Dodd 2012; Byrd and Dodd 2015; Cheh 2011), our data quality review paid special attention to encounter data quality. More details on our MLTSS program selection and approach to data quality checks are included in Appendix B.

Results. Five MLTSS programs passed our data quality checks and were included in the evaluation to address Questions 2 and 3: (1) the Florida Statewide Medicaid Managed Care Long-Term Care Program; (2) Kansas KanCare (MLTSS component); (3) New Mexico Centennial Care (MLTSS component): (4) New York Medicaid Advantage Plus (MAP); and (5) Tennessee TennCare CHOICES in Long-Term Care.

C. Methods

1. Study design by MLTSS program

For all five programs, we used a repeated cross-sectional (RCS) design; however, we evaluated three states using a matched comparison group and the remaining two using an unmatched design. For each program, we selected the most rigorous design approach possible, given the particular features of that program and the data available to evaluate it. Table III.1 lists the study design and intervention periods we analyzed for each of the five MLTSS programs in the evaluation.

Table III.1. Evaluation design and time periods, by MLTSS program

MLTSS program	Program start	Comparison state	Evaluation period
Programs evaluated using matched RCS design			
Florida Statewide Medicaid Managed Care Long-Term Care Program	August 1, 2013	South Carolina	August 2014–December 2017[a]
Kansas KanCare (MLTSS component)	January 1, 2013	Oklahoma	January 2015–December 2017[b]
Tennessee TennCare CHOICES in Long-Term Care	March 1, 2010	Georgia	October 2015–December 2017[c]
Programs evaluated using unmatched RCS design			
New Mexico Centennial Care (MLTSS component)	August 1, 2008	N/A	January 2014–December 2017[d]
New York MAP	October 1, 2007	N/A	July 2015–December 2017[e]

MAP = Medicaid Advantage Plus; MLTSS = managed long-term services and supports; RCS = repeated cross-sectional; TAF = T-MSIS Analytic File.

[a] South Carolina adopted TAF in September 2014. We began the evaluation one month later to correspond to the second year of the MLTSS program.

[b] Oklahoma adopted TAF in October 2014. We began the evaluation in January 2015 to correspond to the third year of the MLTSS program.

[c] Tennessee and Georgia both adopted TAF in October 2015.

[d] New Mexico adopted TAF in January 2014.

[e] New York adopted TAF in July 2015.

Although we intended to use more rigorous evaluation designs, such as a difference-in-differences (DID) design, we ultimately were unable to do so. When we constructed the outcome measures across the period from 2012 to 2017, we observed large differences in outcomes based on the source of the data (MAX/Alpha-MAX versus TAF), making the parallel trends assumption on which the DID framework relies untenable. Therefore, in Florida and Kansas, where we could have observed baseline differences because their MLTSS programs started after our study begin date, we were unable to implement a DID design because of the inconsistencies in the outcome measures over time that coincided with the baseline and intervention periods for these programs. Ultimately, we limited our analysis period for all five MLTSS programs to the time periods that related to TAF data due to the inconsistency in the outcome measures across data sources.

Even though we were unable to conduct a DID analysis for any MLTSS program, we still intended to use a more rigorous *matched* RCS design for each state. However, after eliminating states with data quality issues we found no appropriate FFS comparisons for the programs in New Mexico or New York, so we used a less rigorous unmatched RCS design with no comparison state for these program evaluations. Appendix B includes additional details about the framework for selecting the study design and comparison states.

2. Sample identification for MLTSS programs evaluated using a matched FFS comparison group design

a.   Defining the study group in the intervention period

For MLTSS programs analyzed using a matched FFS comparison group, we used finder files (Kansas and Tennessee) or identifiers in the Medicaid administrative data (Florida) to identify MLTSS enrollees with an institutional LOC. Details for identifying enrollees within each MLTSS program are provided in Appendix B.

To mitigate potential biases that could occur if enrollees switched service delivery systems midway through the study, we used an intent-to-treat (ITT) approach to identify the study sample. Specifically, we identified the earliest month and year in which beneficiaries with an institutional LOC were enrolled in the relevant MLTSS program. After the first month of enrollment, we included beneficiaries for all subsequent months of the evaluation period in which they met all five monthly sample criteria (see Exhibit III.1), regardless of whether they were still enrolled in the relevant MLTSS program or met the institutional LOC for the program. We excluded beneficiaries only for months in which they did not meet one or more of the five monthly sample criteria.
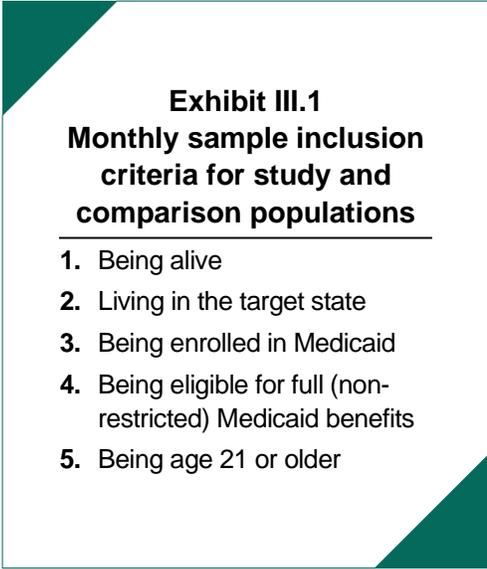
Exhibit III.1
Monthly sample inclusion criteria for study and comparison populations

1. Being alive
2. Living in the target state
3. Being enrolled in Medicaid
4. Being eligible for full (non-restricted) Medicaid benefits
5. Being age 21 or older

b.   Defining the potential comparison group

When possible, we identified a comparison group of beneficiaries receiving LTSS via FFS in states similar to those operating MLTSS programs. Methods for identifying a comparison state for each MLTSS state are described in Appendix B. To define the potential comparison group for each program, we identified beneficiaries in selected comparison states based on (1) enrollment in a 1915(c) waiver[24] for a similar target population covered by the matched MLTSS program or (2) nursing facility use.

As we did for the MLTSS sample identification, we used an ITT approach to identify the potential comparison sample. After identifying the earliest month and year in which beneficiaries were enrolled in a relevant 1915(c) waiver or had nursing facility use, beneficiaries remained in the *potential* comparison group for all subsequent months of the evaluation period in which they met all five monthly sample criteria required for the MLTSS enrollees (Exhibit III.1), regardless of whether they were still enrolled in a relevant waiver or still a nursing facility resident. We

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[24] Waiver services may be furnished only to individuals who are determined to require the level of care furnished in a hospital, nursing facility, or ICF/IID when the costs of such institutional care are reimbursable under the State plan.

excluded potential comparison beneficiaries for months in which they did not meet one or more of the five monthly sample criteria.[25] The specific waivers for each state and inclusion criteria for nursing facility users are described in Appendix B.

c.   Matching approach for comparison beneficiary selection

After we identified a potential comparison group, we refined the group so it appeared more similar to the study group on key characteristics that could be related to outcomes. For Kansas and Tennessee, we used a propensity score matching procedure. For Florida, where the pool of potential comparisons in South Carolina was much smaller than the number of MLTSS enrollees in Florida, we used a propensity score weighting procedure. For both approaches we aimed for balance within certain strata, defined by whether the beneficiary was at least 65 years old and had dual status (among those under 65). Both matching and the weights were updated annually to ensure a good balance between groups over time.

We estimated propensity scores using exogenous sample characteristics only—that is, characteristics we assumed were unrelated to MLTSS participation. The characteristics used in the propensity score model include demographics (for example, age and gender); chronic and disabling health conditions; whether the beneficiary was ever enrolled in a Medicare managed care program; and history of Medicaid enrollment, study eligibility, and dual status.

d.   Comparison to the matched sample

For each beneficiary characteristic, we considered the samples to be well balanced if the standardized difference between the MLTSS and comparison groups was less than 0.25—a commonly accepted benchmark (Stuart 2010). Based on this criterion, the final (weighted) samples were well matched on nearly every characteristic in each of the evaluation years (see Appendix B). Exceptions occurred among Kansas MLTSS enrollees for some chronic conditions which were very rare in the matched comparison state (Oklahoma), making them difficult to match. We do not believe that any of these chronic conditions are strongly associated with outcomes, so this exception is unlikely to adversely affect the validity of our findings.

Despite our efforts to create a matched comparison group for each state, there may still be state-specific environmental factors that influenced the outcomes over time. In addition, differences between the study and comparison states in data reporting for specific services may have influenced differences between the MLTSS states and FFS comparisons in each year. Furthermore, although we matched as many beneficiary characteristics reported in Medicaid administrative data as possible, we did not have data to match the MLTSS and comparison groups on other characteristics, such as functional limitations or living arrangements, known to affect use of hospitals, nursing homes, and HCBS. For these reasons, unobserved differences between the two groups and selection bias may influence the findings.

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[25] Comparison beneficiaries were included in the final analysis only for those periods in which they were matched.

3.   Sample identification for unmatched MLTSS programs: defining the study group

Similar to the MLTSS sample identification for Florida, Kansas, and Tennessee, we used a finder file (New Mexico) or identifiers in the Medicaid administrative data (New York) to identify MLTSS enrollees with an institutional LOC (Appendix B). We also used an ITT design to identify the sample for these two programs. As we did for the MLTSS samples for Florida, Kansas, and Tennessee, we identified the earliest month and year in which beneficiaries with an institutional LOC were enrolled in the relevant MLTSS program. After the first month of enrollment, we included beneficiaries for all subsequent months of the evaluation period in which they met all five monthly sample criteria (Exhibit III.1), regardless of whether they were still enrolled in the relevant MLTSS program or met the institutional LOC for the program.

4.   Claims-based service use and quality of care outcome measures

We selected measures commonly regarded as important outcomes of MLTSS programs and feasible to construct with available data (Table III.2). For service use, we evaluated eight claims-based measures for Medicaid-only and dual eligible beneficiaries that reflect use of different types of LTSS. We also evaluated one claims-based measure—hospital inpatient days—for Medicaid-only beneficiaries. For quality of care, we evaluated one[26] claims-based medical care measure—potentially avoidable hospitalizations—for Medicaid-only beneficiaries.[27] We did not evaluate hospital inpatient days and potentially avoidable hospitalizations for the New York MAP program because the program includes only dual eligible enrollees. Details about these outcome measures are included in Appendix B.

We limited our analysis of medical care outcomes to Medicaid-only beneficiaries for several reasons. First, in each MLTSS program we examined in this evaluation, medical care benefits for dual eligible beneficiaries are covered by a different entity than the MLTSS plan—either by traditional Medicare FFS or a separate non-integrated Medicare Advantage (MA) plan. Although we could obtain Medicare FFS claims, MA encounter data were not available for our analysis; therefore, we are unable to construct medical care measures for a large proportion of the dual eligible MLTSS population in MA plans. In 2017, 32 percent of full-benefit dual eligible beneficiaries were enrolled in an MA plan (CMS Medicare Medicaid Coordination Office [MMCO] 2018). Second, non-integrated MLTSS plans are not liable for medical services that Medicare pays for, so they have no direct financial incentive or mechanism to control medical service use.

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[26] As described in the evaluation design report (Wysocki et al. 2019), we had intended to construct an additional quality of care outcome measure for minimizing institutional length of stay. However, due to data issues with defining total nursing facility length of stay among several of the programs included in our evaluation, we were unable to evaluate this measure.

[27] Because the MLTSS programs in this study also cover medical and ambulatory care services for Medicaid-only beneficiaries, the potentially avoidable hospitalization measure can be interpreted as a measure of overall quality of and access to care for MLTSS enrollees. It does not represent the *quality of LTSS* provided by the MLTSS plan and program.

Table III.2. Claims-based service use and quality of care outcome measures

Research question	Measure	Definition	Exclusions
Priority measures; results presented in Section III.E			
(2) How does service use compare between MLTSS and FFS systems?	Nursing facility use	Use of any nursing facility service in a month	None
	HCBS use[a]	Use of any HCBS in a month	None
	Inpatient hospital days	Number of inpatient hospital days per year	Not calculated for dual eligible enrollees or any enrollees in NY's MAP program (all of whom are dually eligible)
(3) How does the quality of care compare between MLTSS and FFS systems?	Potentially avoidable hospitalizations	Indicator for having at least one potentially avoidable hospitalization due to an ambulatory care-sensitive condition (AHRQ ACSC PQI #90) in a month	Not calculated for dual eligible enrollees or any enrollees in NY's MAP program (all of whom are dually eligible)
Specific HCBS; results presented in Appendix B			
(2) How does service use compare between MLTSS and FFS systems?	Round-the-clock services use[b]	Use of any round-the-clock services in a month	None
	Day services use	Use of any day services in a month	None
	Home-delivered meals use	Use of any home-delivered meals in a month	None
	Home-based services use[c]	Use of any home-based services in a month	None
	Caregiver support services use	Use of any caregiver support services in a month	None
	Equipment, technology, and modifications use	Use of any equipment, technology, or modifications in a month	None

Notes: Programs in the evaluation included Florida Statewide Medicaid Managed Care Long-Term Care Program, Kansas KanCare (MLTSS component), New Mexico Centennial Care (MLTSS component), New York Medicaid Advantage Plus (MAP), and Tennessee TennCare CHOICES in Long-Term Care.

ACSC = ambulatory care-sensitive condition; AHRQ = Agency for Healthcare Research and Quality; FFS = fee-for-service; HCBS = home- and community-based services; MAP = Medicaid Advantage Plus; MLTSS = managed long-term services and supports; NY = New York; PQI = Prevention Quality Indicators.

[a] HCBS use is based on the other HCBS measures we examined: round-the-clock services use; day services use; home-delivered meals use; home-based services use; caregiver support services use; and equipment, technology, and modifications use.

[b] "Round-the-clock services" refer to services by a provider that has round-the-clock responsibility for the health and welfare of residents, except during the time other services (for example, day services) are furnished. They may be provided in group or shared living settings or in the home.

[c] "Home-based services" refer to services that support a person in his or her home or apartment when the provider does not have round-the-clock responsibility for the person's health and welfare. These services can be provided in other community settings but are primarily furnished in a person's home or apartment. They include home-based habilitation, home health aide, personal care, companion, homemaker, and chore services.

5.   Program-level regression analysis

For each outcome and program, we fit a regression model to estimate the average level of each outcome. For states with a matched comparison design, we also fit a regression model to estimate the difference in outcomes between MLTSS and FFS beneficiaries. Nine of the 10 outcomes (all except hospital inpatient days) are dichotomous indicators at the monthly level. For these outcomes, we fit a logistic regression model that estimates the probability of observing each indicator during any particular month.[28] For hospital inpatient days, we fit a linear regression model where the outcome is the annualized[29] number of inpatient hospital days for each beneficiary in each year. All models control for beneficiary characteristics including demographics (age and sex); chronic and disabling health conditions; whether the beneficiary ever enrolled in a Medicare managed care program; and history of Medicaid enrollment, study eligibility, and dual eligible status (when applicable).

For programs without a matched comparison group, we included interactions between study year and dual status, so that we estimated a different level of each outcome for each year, separately by duals and non-duals. For programs with a matched comparison group, we included interactions between study year, dual status, and state, so that we estimated the difference between the MLTSS and comparison states separately by study year and dual status. We limited our analysis period to time periods that corresponded to TAF data for each MLTSS and comparison state (Table III.1). Models are described in more detail in Appendix B.

D. Level of service use and quality of care for MLTSS programs

In this section, we present regression-adjusted mean outcomes for four priority measures of service use and quality of care: (1) nursing facility use, (2) HCBS use, (3) inpatient hospital days, and (4) potentially avoidable hospitalizations for each MLTSS program for each year of the analysis (Figure III.1). The six additional specific HCBS measures are presented in Appendix B (Figure B.7).

Nursing facility use. For dual eligibles, nursing facility use ranged from 4 percent among MLTSS enrollees in the New York MAP program to 62 percent among MLTSS enrollees in the Tennessee CHOICES program. The range was slightly lower for Medicaid-only enrollees, ranging from 3 percent among New Mexico Centennial Care enrollees to 48 percent among Florida MLTSS enrollees. Among dually eligible beneficiaries, nursing facility use declined for MLTSS enrollees in New Mexico and Florida but remained relatively steady for MLTSS enrollees in Kansas, New York MAP, and Tennessee. Nursing facility use declined slightly for

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[28] Although we defined the potentially avoidable hospitalization outcome to be dichotomous at the monthly level and analyzed it using logistic regression, because the outcome is rare, we did not display results as monthly probabilities. Rather, we multiplied the probabilities by 1,000 to present them as the expected number of months with a potentially avoidable hospitalizations per 1,000 beneficiary months.

[29] In order to annualize inpatient days, we took the observed number of inpatient days for the year, divided by the number of observed months, and multiplied by 12.

Medicaid-only MLTSS enrollees in all four states (New York MAP has only dual eligible enrollees).

HCBS use. For HCBS use among dually eligible beneficiaries, enrollees in Tennessee had the lowest use, at around 30 percent, and enrollees in New York MAP had the highest use, at around 90 percent. For Medicaid-only enrollees, HCBS use ranged from 42 percent among Florida enrollees to 90 percent among New Mexico enrollees. Patterns of HCBS use among the respective populations in these programs were the inverse of those for nursing facility use; that is, the states with the highest (lowest) HCBS use had the lowest (highest) nursing facility use. Although HCBS use declined over time for dually eligible beneficiaries in New Mexico, it remained relatively steady for dual eligible enrollees in other programs.

Inpatient hospital days and potentially avoidable hospitalizations. Inpatient hospital days among Medicaid-only enrollees ranged from 2.7 days per beneficiary year in Kansas to 10.9 days in Florida. Inpatient hospital days declined for all MLTSS programs. Potentially avoidable hospitalizations were also lowest among Medicaid-only enrollees in Kansas (3.0 expected months with a potentially-avoidable hospitalization per 1,000 beneficiary months) and highest among Medicaid-only enrollees in Florida (14.4). Potentially avoidable hospitalizations also declined for all four MLTSS programs (New York has only dual eligible enrollees).

Figure III.1. Regression-adjusted mean outcomes for all states for the four priority measures of service use and quality of care
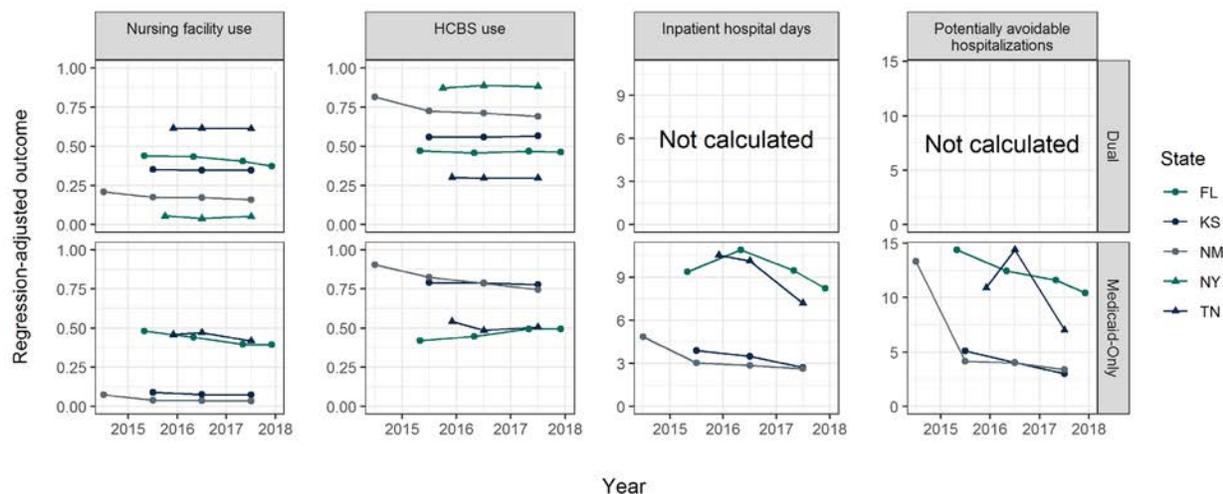
Note: Estimates for nursing facility use and HCBS use are expressed as percentages per month, estimates for inpatient hospital days are expressed as mean inpatient days per year, and estimates for potentially avoidable hospitalizations are expressed as the expected number of months with a potentially avoidable hospitalization per 1,000 beneficiary months. Programs in the evaluation included Florida Statewide Medicaid Managed Care Long-Term Care Program, Kansas KanCare (MLTSS component), New Mexico Centennial Care (MLTSS component), New York Medicaid Advantage Plus (MAP), and Tennessee TennCare CHOICES in Long-Term Care.

FL = Florida; HCBS = home and community-based services; KS = Kansas; NM = New Mexico; NY = New York; TN = Tennessee.

E. Service use and quality of care for MLTSS programs evaluated using a matched FFS comparison group design

In this section, we describe findings from each of the three MLTSS programs evaluated using matched comparison group designs: Florida Statewide Medicaid Managed Care Long-Term Care Program, Kansas KanCare (MLTSS component), and Tennessee TennCare CHOICES in Long-Term Care. Descriptive characteristics of the samples are presented in Appendix B.

1. Florida Statewide Medicaid Managed Care Long-Term Care Program

Sample characteristics. Across the years included in our analysis, the Florida sample and the weighted comparison sample in South Carolina (Table B.6) consisted of a high proportion of older adults (more than 80 percent of the samples were age 65 or older), females (around 69 percent), urban residents (around 94 percent), and dually eligible beneficiaries (around 94 percent). The most common chronic or disabling conditions among the samples included hypertension, Alzheimer's or other dementia, anemia, depression, and hyperlipidemia.

Nursing facility use. Among dual eligible MLTSS enrollees in Florida, we estimate nursing facility use to be lower than it would have been had enrollees received FFS LTSS in the comparison state (hereafter referred to as the counterfactual). This difference became larger over time, ranging from 1.6 percentage points in Year 1 of the analysis to 11.9 percentage points in Year 4 (Table III.3). Among Medicaid-only MLTSS enrollees, nursing facility use was higher in Florida than under the counterfactual for each year, but the differences declined over time, from 26.1 percentage points higher in Year 1 to 11.0 percentage points higher in Year 4.

HCBS use. We found that dual eligible MLTSS enrollees had greater overall HCBS use in Florida than under the counterfactual in all years of the analysis. Although the difference declined slightly over time, the difference between the MLTSS enrollees and the counterfactual remained large (18.0 percentage points in Year 1, 14.1 percentage points in Year 4). For the Medicaid-only MLTSS enrollees, there was slightly lower HCBS use in Years 1 and 2 (5.4 and 2.3 percentage points lower, respectively), and then greater HCBS use in Years 3 and 4 (2.8 and 4.9 percentage points higher, respectively). Most categories of HCBS,[30] aside from home-delivered meals, also showed greater use among dual eligible MLTSS enrollees compared to the counterfactual (Table B.13). The differences were greatest for round-the-clock services[31] (13 percent vs. 0 percent) and personal care and other home-based service use (34–35 percent vs. 28–31 percent; Table B.11). For Medicaid-only MLTSS enrollees, the picture was more mixed. There was consistently lower use of home-delivered meals and home-based service use under MLTSS than the counterfactual across all four years, but results varied over time for other categories, such as day services and equipment, technology, and modifications use.

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[30] For some categories of HCBS with 0 percent of beneficiaries using the service, it is unclear whether these findings are due to missing data or reflect real patterns of use.

[31] Round -the -clock services are generally provided in group homes and other residential care settings, such as adult foster care, which have support staff on site around the clock.

Inpatient hospital days and potentially avoidable hospitalizations. The average number of inpatient hospital days was lower for Medicaid-only MLTSS enrollees in Florida than under the counterfactual, though this difference declined after the first year. These enrollees also had fewer potentially avoidable hospitalizations in all four years, compared to the counterfactual.

Table III.3. MLTSS estimates on priority measures of service use and quality of care for Florida Statewide Medicaid Managed Care Long-Term Care Program

Measure	Population	Year 1 (Oct 2014–Sep 2015)			Year 2 (Oct 2015 –Sep 2016)			Year 3 (Oct 2016–Sep 2017)			Partial Year 4 (Oct–Dec 2017)		
		MLTSS (SE)	FFS (SE)	Diff. (SE)	MLTSS (SE)	FFS (SE)	Diff. (SE)	MLTSS (SE)	FFS (SE)	Diff. (SE)	MLTSS (SE)	FFS (SE)	Diff. (SE)
Nursing facility use	Dual eligible	43.9 (0.2)	45.5 (0.4)	**-1.6 (0.5)**	43.3 (0.1)	50.6 (0.4)	**-7.3 (0.4)**	40.5 (0.1)	51.1 (0.4)	**-10.5 (0.4)**	37.2 (0.1)	49.1 (0.4)	**-11.9 (0.4)**
	Medicaid-only	48.2 (0.7)	22.1 (1.4)	**26.1 (1.5)**	44.0 (0.6)	27.9 (1.5)	**16.1 (1.6)**	39.6 (0.6)	29.8 (1.3)	**9.8 (1.4)**	39.4 (0.6)	28.4 (1.4)	**11.0 (1.5)**
HCBS use	Dual eligible	47.0 (0.2)	28.9 (0.4)	**18.0 (0.5)**	45.9 (0.1)	29.8 (0.4)	**16.1 (0.4)**	46.9 (0.1)	31.0 (0.4)	**15.8 (0.4)**	46.3 (0.1)	32.2 (0.4)	**14.1 (0.4)**
	Medicaid-only	41.9 (0.7)	47.3 (1.5)	**-5.4 (1.6)**	44.6 (0.6)	46.9 (1.5)	**-2.3 (1.6)**	49.3 (0.6)	46.5 (1.3)	**2.8 (1.4)**	49.4 (0.6)	44.5 (1.4)	**4.9 (1.5)**
Inpatient hospital days	Medicaid-only	9.39 (0.39)	16.51 (0.94)	**-7.12 (0.94)**	10.92 (0.31)	12.69 (0.86)	**-1.76 (0.91)**	9.48 (0.28)	11.49 (1.03)	**-2.01 (1.04)**	8.23 (0.30)	10.50 (0.77)	**-2.27 (0.80)**
Potentially avoidable hospitalizations	Medicaid-only	14.4 (0.9)	26.4 (3.0)	**-12.0 (2.9)**	12.5 (0.6)	18.8 (2.3)	**-6.4 (2.4)**	11.6 (0.6)	16.2 (2.1)	**-4.5 (2.2)**	10.4 (0.7)	16.2 (2.3)	**-5.8 (2.4)**

Note: This table presents regression-adjusted means for Florida MLTSS enrollees under both MLTSS and the FFS counterfactual, and the difference between the two groups (the model estimate). The FFS counterfactual is defined as the expected mean outcome of the MLTSS enrollees had they lived in South Carolina and participated in that state's FFS LTSS program. Results are presented separately for dually eligible and Medicaid-only beneficiaries. Estimates for nursing facility and HCBS use are expressed as percentages per month, estimates for inpatient hospital days are expressed as mean inpatient days per year, and estimates for potentially avoidable hospitalizations are expressed as the expected number of months with a potentially avoidable hospitalization per 1,000 beneficiary months. Medicaid-only beneficiaries comprised 5.4 to 6.3 percent of the sample across years, which ranged from approximately 5,348 to 7,565 beneficiaries.

Diff. = difference; FFS = fee-for-service; HCBS = home and community-based services; MLTSS = managed long-term services and supports; SE = standard error.

2.   Kansas KanCare Program (MLTSS component)

Sample characteristics. The Kansas sample and the matched comparison sample from Oklahoma (Table B.7) were approximately evenly split between beneficiaries age 65 and older and beneficiaries age 21 to 64. Both samples had high percentages of females (around 61 percent), urban residents (around 79 percent), and dual eligibles (around 82 percent). The most common chronic or disabling conditions among the samples were hypertension, depression, major depression, diabetes, and hyperlipidemia.

Nursing facility use. For dual eligible MLTSS enrollees in Kansas, nursing facility use was slightly lower under MLTSS than the counterfactual for each year of our analysis, with differences becoming slightly larger over time, from 0.9 percentage points lower in Year 1 to 1.4 percentage points lower in Year 3 (Table III.4). Among Medicaid-only MLTSS enrollees, nursing facility use was also lower than the counterfactual in each year, but the differences declined over time, from 21.1 percentage points in Year 1 to 12.4 percentage points in Year 3.

HCBS use. Dual eligible MLTSS enrollees had lower overall HCBS use than the counterfactual, but the differences declined over time (4.6 and 2.1 percentage points lower use in Year 1 and Year 3, respectively). The pattern differed for Medicaid-only MLTSS enrollees; for them, HCBS use was greater under MLTSS than the counterfactual, but the differences became smaller over time (from a 12.8 percentage point difference in Year 1 to 9.1 in Year 3). For dual eligible MLTSS enrollees, the lower overall HCBS use relative to the counterfactual was driven by lower use of home-delivered meals; caregiver support services; and equipment, technology, and modifications (Table B.14). This group otherwise had higher use of round-the-clock, day, and home-based services. Medicaid-only MLTSS enrollees had lower use of round-the-clock services; home-delivered meals; caregiver support services; and equipment, technology, and modifications than the counterfactual. However, we estimate much higher use of home-based services and higher use of day services in Kansas as compared to the counterfactual, which contributed to the overall finding of greater HCBS use among Medicaid-only MLTSS enrollees.

Inpatient hospital days and potentially avoidable hospitalizations. Medicaid-only MLTSS enrollees had fewer inpatient hospital days and potentially avoidable hospitalizations in each year relative to the counterfactual, although these differences declined after the first year.

Table III.4. MLTSS estimates on priority measures of service use and quality of care for Kansas KanCare (MLTSS component)

Measure	Population	Year 1 (Jan–Dec 2015)			Year 2 (Jan–Dec 2016)			Year 3 (Jan–Dec 2017)		
		MLTSS (SE)	FFS (SE)	Diff. (SE)	MLTSS (SE)	FFS (SE)	Diff. (SE)	MLTSS (SE)	FFS (SE)	Diff. (SE)
Nursing facility use	Dual eligibles	35.2 (0.2)	36.1 (0.4)	**-0.9 (0.4)**	34.6 (0.2)	35.8 (0.4)	**-1.2 (0.5)**	34.8 (0.2)	36.2 (0.4)	**-1.4 (0.4)**
	Medicaid-only	8.9 (0.3)	29.9 (1.2)	**-21.1 (1.2)**	7.6 (0.3)	20.0 (0.8)	**-12.3 (0.8)**	7.4 (0.3)	19.8 (0.8)	**-12.4 (0.9)**
HCBS use	Dual eligibles	55.8 (0.2)	60.4 (0.4)	**-4.6 (0.5)**	55.9 (0.2)	59.8 (0.4)	**-3.9 (0.5)**	56.5 (0.2)	58.5 (0.4)	**-2.1 (0.5)**
	Medicaid-only	79.0 (0.5)	66.2 (1.2)	**12.8 (1.3)**	78.7 (0.4)	70.0 (1.0)	**8.7 (1.1)**	77.8 (0.4)	68.6 (1.1)	**9.1 (1.1)**
Inpatient hospital days	Medicaid-only	3.88 (0.14)	9.05 (0.56)	**-5.17 (0.57)**	3.50 (0.13)	6.50 (0.38)	**-3.00 (0.41)**	2.70 (0.11)	5.80 (0.30)	**-3.10 (0.32)**
Potentially avoidable hospitalizations	Medicaid-only	5.1 (0.4)	15.1 (1.5)	**-10.0 (1.6)**	4.0 (0.3)	8.4 (1.0)	**-4.4 (1.1)**	3.0 (0.2)	6.7 (0.7)	**-3.7 (0.8)**

Note: This table presents regression-adjusted means for Kansas MLTSS enrollees under MLTSS and the FFS counterfactual, and the difference between the two groups (the model estimate). The FFS counterfactual is defined as the expected mean outcome of the MLTSS enrollees had they lived in Oklahoma and participated in that state's FFS LTSS program. Results are presented separately for dual eligible and Medicaid-only beneficiaries. Estimates for nursing facility use and HCBS use are expressed as percentages per month, estimates for inpatient hospital days are expressed as mean inpatient days per year, and estimates for potentially avoidable hospitalizations are expressed as the expected number of months with a potentially avoidable hospitalization per 1,000 beneficiary months.

Diff. = difference; FFS = fee-for-service; HCBS = home and community-based services; MLTSS = managed long-term services and supports; SE = standard error.

3.   Tennessee TennCare CHOICES in Long-Term Care Program

Sample characteristics. In Tennessee and the matched Georgia samples, the majority of the beneficiaries were 65 and older (around 74 percent), female (around 67 percent), residing in an urban area (around 62 percent), and dual eligible (around 87 percent). The most common chronic or disabling conditions were hypertension, Alzheimer's or other dementia, major depression, depression, and anemia (Table B.8).

Nursing facility use. Our evaluation found that nursing facility use was greater among both dual eligible and Medicaid-only enrollees under MLTSS compared to the counterfactual (Table III.5). For dual eligibles, the difference between MLTSS enrollees and the counterfactual increased slightly over time (from 3.7 percentage points in Year 1 to 7.8 percentage points in Year 3), while for Medicaid-only MLTSS enrollees, the difference was larger and more stable over time (18.5 and 17.9 percentage points in Year 1 and Year 3, respectively). These findings largely are consistent with findings from the interim evaluation (Libersky et al. 2018).

HCBS use. We estimate dually eligible MLTSS enrollees to have slightly higher HCBS use in Year 1 than the counterfactual, but lower use in Years 2 and 3. This pattern was similar for HCBS use among Medicaid-only MLTSS enrollees. Aside from caregiver support services use among both dual eligible and Medicaid-only MLTSS enrollees in Year 3, and equipment, technology, and modifications use among Medicaid-only MLTSS enrollees in Years 1 to 3, all other categories of HCBS showed lower use among MLTSS enrollees than the counterfactual in all years (Table B.15). These findings largely are consistent with findings from the interim evaluation.

Inpatient hospital days and potentially avoidable hospitalizations. The number of inpatient hospital days was slightly greater among Medicaid-only MLTSS enrollees than the counterfactual. We found fewer potentially avoidable hospitalizations under MLTSS than the counterfactual, though the estimated differences were small relative to their standard errors. Findings from the interim evaluation indicated that hospital use among MLTSS enrollees increased in Tennessee, which is consistent with the finding for inpatient hospital days; however, these additional findings suggest that MLTSS enrollees may have fewer potentially avoidable hospitalizations.

Table III.5. MLTSS estimates on priority measures of service use and quality of care for Tennessee TennCare CHOICES in Long-Term Care

Measure	Population	Partial Year 1 (Oct–Dec 2015)			Year 2 (Jan–Dec 2016)			Year 3 (Jan–Dec 2017)		
		MLTSS (SE)	FFS (SE)	Diff. (SE)	MLTSS (SE)	FFS (SE)	Diff. (SE)	MLTSS (SE)	FFS (SE)	Diff. (SE)
Nursing facility use	Dual eligibles	61.4 (0.3)	57.7 (0.4)	**3.7 (0.4)**	61.6 (0.2)	55.9 (0.3)	**5.8 (0.4)**	61.3 (0.2)	53.5 (0.3)	**7.8 (0.4)**
	Medicaid-only	45.9 (0.8)	27.4 (0.7)	**18.5 (1.1)**	47.1 (0.7)	29.4 (0.6)	**17.7 (0.9)**	41.8 (0.7)	23.8 (0.8)	**17.9 (1.0)**
HCBS use	Dual eligibles	30.2 (0.3)	29.8 (0.3)	**0.4 (0.4)**	29.6 (0.2)	30.8 (0.3)	**-1.2 (0.3)**	29.6 (0.2)	32.1 (0.3)	**-2.5 (0.4)**
	Medicaid-only	54.3 (0.8)	53.3 (0.7)	**1.1 (1.1)**	48.5 (0.7)	49.9 (0.6)	**-1.4 (0.9)**	50.5 (0.7)	56.8 (0.8)	**-6.4 (1.0)**
Inpatient hospital days	Medicaid-only	10.55 (0.64)	7.67 (0.45)	**2.88 (0.70)**	10.14 (0.37)	9.10 (0.35)	**1.04 (0.42)**	7.20 (0.34)	6.67 (0.47)	**0.53 (0.68)**
Potentially avoidable hospitalizations	Medicaid-only	10.9 (1.4)	13.0 (1.7)	**-2.1 (2.1)**	14.4 (1.0)	15.2 (1.1)	**-0.8 (1.4)**	7.0 (0.5)	9.6 (0.7)	**-2.5 (0.9)**

Note: This table presents regression-adjusted means for Tennessee MLTSS enrollees under MLTSS and the FFS counterfactual, and the difference between the two groups (the model estimate). The FFS counterfactual is defined as the expected mean outcome of the MLTSS enrollees had they lived in Georgia and participated in that state's FFS LTSS program. Results are presented separately for dual eligible and Medicaid-only beneficiaries. Estimates for nursing facility use and HCBS use are expressed as percentages per month, estimates for inpatient hospital days are expressed as mean inpatient days per year, and estimates for potentially avoidable hospitalizations are expressed as the expected number of months with a potentially avoidable hospitalization per 1,000 beneficiary months.

Diff. = difference; FFS = fee-for-service; HCBS = home and community-based services; MLTSS = managed long-term services and supports; SE = standard error.

IV. BENEFICIARY ACCESS, EXPERIENCE OF CARE, AND QUALITY OF LIFE IN MLTSS DELIVERY MODELS COMPARED TO FFS

This section examines Research Questions 3 and 4, concerning how beneficiary self-reported access to care, experience of care, and quality of life compare between MLTSS and FFS delivery models. It begins by presenting the study hypotheses, the NCI-AD data and survey items used in the analysis, and the analytic method. It then presents findings for 10 NCI-AD domains; findings for individual survey items and detailed study methods are in Appendix C.

A. Study hypotheses, data sources, and analytic method

Study hypotheses. Because MLTSS programs allow states to hold managed care plans accountable for improving enrollee outcomes, we hypothesized that MLTSS programs will have a favorable impact on beneficiary-reported measures of access, experience of care, and quality of life relative to those receiving services through FFS programs. We also hypothesized that the magnitude of the impact will become larger with each subsequent study year, as states and managed care plans measure these outcomes and improve MLTSS program operations to raise beneficiary ratings.

Data sources. To test these hypotheses, we used NCI-AD survey data reported in 7 states with MLTSS programs and 14 states that cover institutional services and/or HCBS on a FFS basis (see box below). We abstracted program-level data from the comprehensive reports of survey results produced by the survey sponsors, ADvancing States[32] and the Human Services Research Institute (HSRI), for survey waves 2015–2016, 2016–2017, and 2017–2018. Some states include seniors and adults with physical disabilities who are accessing non-Medicaid publicly funded LTSS as part of their NCI-AD survey sample, so where possible, we limited our study population to Medicaid-funded LTSS (that is, MLTSS programs, 1915(c) waivers, and nursing facilities). However, because NCI-AD can be used across payers and the specificity of the sample definition varied by state, its possible that we inadvertantly included non-Medicaid covered beneficiaries. We selected 33 survey items (of more than 100) that were reported in all three survey waves and best represented the three outcomes of interest for MLTSS programs: (1) for beneficiary experience, we examined survey items in the domains of satisfaction, service coordination, and care coordination; (2) for access, we examined the domains of access and health care; and (3) for quality of life, we examined the domains of relationships, safety, rights and respect, everyday living, and control. (Appendix C contains a full list of measures and associated domains.)

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[32] Before 2019, ADvancing States was known as the National Association of States United for Aging and Disabilities (NASUAD). This report uses ADvancing States to refer to the organization generally but uses NASUAD in publications produced under the organization's previous name.

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About the NCI-AD survey

NCI-AD is a voluntary survey available to state aging and disability agencies to assess the quality of life and outcomes of seniors and adults with physical disabilities who are accessing publicly funded services, including MLTSS. NCI-AD applies to any publicly funded LTSS program, including those that cover nursing facilities. The survey collects information on key facets of LTSS, such as service and care coordination, community participation, choice and decision making, employment, rights and respect, health care and safety (ADvancing States and HSRI 2019). NCI-AD has been fielded in three survey waves beginning 2015, 2016, and 2017. Though MLTSS and FFS states are represented in each year, the mix of states surveyed each year varies. National and state specific findings are available at: https://nci-ad.org/resources/reports/.

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Study design. To estimate impacts of MLTSS programs on measures of self-reported access to care, experience of care, and quality of life, we compared differences between Medicaid beneficiaries enrolled in MLTSS programs to beneficiaries enrolled in FFS programs from 18 states over three survey waves (2015–2018), adjusting for demographic and environmental differences across programs using regression methods. Though MLTSS and FFS states are represented in each year, the mix of states and programs surveyed each year varied (Table IV.1). This pooled analysis captures the overall average difference in outcomes between the MLTSS and FFS programs. To facilitate the analysis, we coded the survey items for positive directionality. That is, the most favorable response for the survey item measuring the proportion of people who have transportation when they want to do things outside the home is "yes," whereas the most favorable response for the proportion of people who need grab bars in the bathroom or elsewhere in home is "has one but doesn't need an upgrade."

Table IV.1. NCI-AD sample size, by survey wave

	All states	MLTSS states (7): DE, KS, MN, NJ, TN, TX, WI	FFS states (14): CO, DE, GA, IN, ME, MN, MS, NE, NJ, NV, OH, OR, VT, WI
2015–2016			
N states	16	6	10
N programs[a]	27	17	10
N respondents	9,835	4,586	5,249
N potential respondents[b]	418,188	287,917	130,271
Response rate (%)	2.4	1.6	4.0
2016-2017			
N states	11	3	8
N programs[a]	19	11	8
N respondents	6,191	1,628	4,563
N potential respondents[b]	209,339	54,080	155,259
Response rate (%)	3.0	3.0	2.9

Table IV.1 (*continued*)

	All states	MLTSS states (7): DE, KS, MN, NJ, TN, TX, WI	FFS states (14): CO, DE, GA, IN, ME, MN, MS, NE, NJ, NV, OH, OR, VT, WI
2017-2018			
N states	15	6	9
N programs[a]	28	19	9
N respondents	12,737	5,838	6,899
N potential respondents[b]	329,520	157,450	172,070
Response rate (%)	3.9	3.7	4.0

FFS = fee-for-service; MLTSS = managed long-term services and supports; N = number; NCI-AD = National Core Indicators-Aging and Disabilities.

[a] In MLTSS states, a "program" represents a state-defined administrative grouping used for data collection during the survey wave (for example, enrollees in a particular plan or waiver); therefore, the count of programs may differ from the number of MLTSS programs listed in Table II.1. In FFS states, a "program" represents the combined sum of responses from HCBS waivers or FFS nursing facility service options in that state; therefore, the number of FFS "programs" is equal to the number of FFS states in each survey wave.

[b] Delaware, Indiana, and Kansas estimated the number of potential respondents (that is, program enrollees) in one or more survey years.

Because all outcome measures were categorical, with the most favorable responses for each survey item representing the highest categorical value, we fit an ordinal logistic regression model to the NCI-AD data. We used a Bayesian hierarchical model, which models all survey items simultaneously in a single model, borrowing strength across survey items and modeling the correlation between their associated parameters. Not only does this approach provide more accurate estimates of the impacts for each item, but it also provides an implicit correction for multiple comparisons[33] (Gelman et al. 2012).

The model estimates a separate impact of MLTSS for each of the 33 NCI-AD survey items for each of the three survey years. Because the survey items are organized within domains, we aggregated the impact estimates for each of the items within each of 10 domains to produce domain-level impacts for each year, and further aggregated items across domains and years to estimate an "overall" impact of MLTSS. We included covariates in the regression models to adjust impacts for observed differences between MLTSS and FFS beneficiaries in demographic and state-level characteristics that could affect program level-outcomes, and accounted for within-program clustering by including a program-specific random effect.

We report impacts from this model in two ways. First, we present odds ratios (OR), which are the odds of a higher (that is, more favorable) response on the survey item for MLTSS respondents relative to FFS respondents, holding other state and program characteristics

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[33] A more traditional "frequentist" approach would fit separate models for each survey indicator. This approach leads "type I" errors, identifying effects as statistically significant when they are due to chance. In addition, the magnitude of the significant effects tends to be biased away from zero ("type M" errors), leading to erroneous conclusions. Though multiple comparisons corrections can guarantee a low type-I error rate, they tend to be conservative (because they do not model correlation across outcomes), and they do not address type-M errors. See Gelman, et. al., 2012 and Gelman and Carlin, 2014 for a more through discussion.

constant. An OR greater than 1 indicates that MLTSS enrollees are more likely to respond favorably on that survey item than FFS beneficiaries, whereas an OR of less than 1 indicates that MLTSS enrollees are less likely to respond favorably than FFS beneficiaries. Second, we also calculate the probability that the OR is greater than 1, which would indicate that MLTSS participation improves the odds of responding favorably to a given survey item. This probability, based on a Bayesian model, is known as a posterior probability (PP). Methods are described in more detail in Appendix C.

B. Findings from NCI-AD survey data on experience of care and quality of life

Overall, MLTSS enrollees were more likely than FFS beneficiaries to respond favorably on NCI-AD survey items (Figure IV.1 and Appendix Table B.4). Averaged across all selected survey items and years, the odds of responding favorably were 28 percent higher for MLTSS enrollees compared to FFS beneficiaries (OR = 1.28; Appendix Table B.4). The corresponding probability that MLTSS participation improves the odds of responding favorably is 87 percent.

Figure IV.1 shows our impact estimates separately for each domain and year. The study found more favorable responses among MLTSS enrollees in all 10 domains, averaged across study years, but the favorable results were most notable for survey questions related to (1) access (OR = 1.60, PP = 98%); (2) control (OR = 1.35, PP = 90%); and (3) relationships (OR = 1.36, PP = 98%). Impacts for each domain were largest in the second study year (2016–2017); however, the sample included the fewest number of MLTSS and FFS programs in the second year (11, compared to 15 in the other two years; Appendix C), raising the possibility that a smaller sample size contributed to the difference in effects.

Figure IV.1. Odds of MLTSS enrollees responding favorably to NCI-AD survey items, overall and by domain, compared to FFS beneficiaries
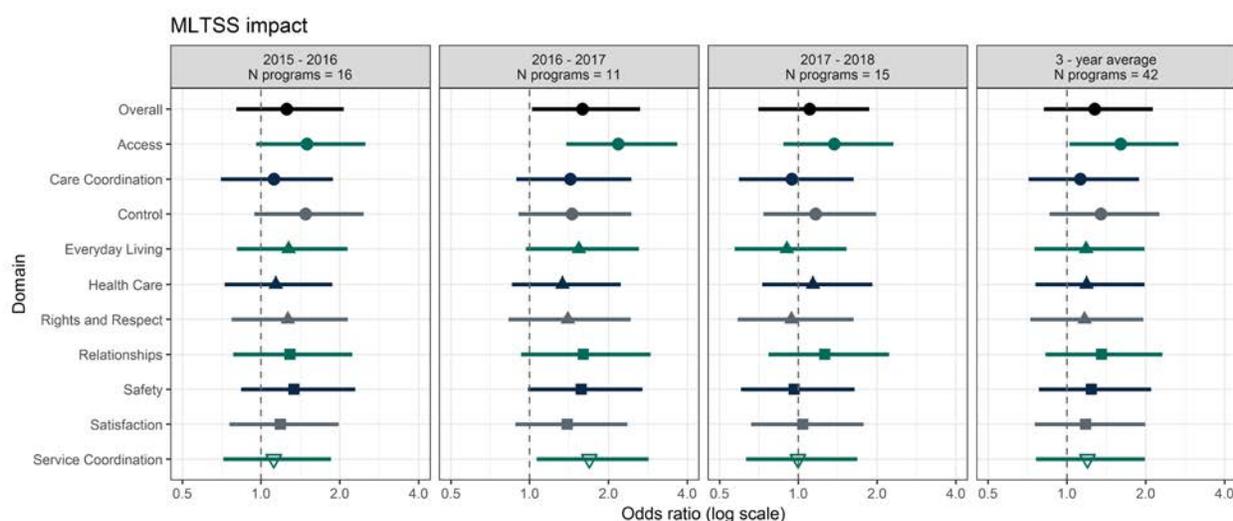
FFS = fee-for-service; MLTSS = managed long-term services and supports; N = number; NCI-AD = National Core Indicators-Aging and Disabilities.

Although the three-year average effect of MLTSS on survey results was favorable at the domain level, there were several domains that had individual survey items with more variation and outcomes that differed from the average outcomes of the domain (Figure IV.2). This finding was most notable for the access and service coordination domains. Specifically, the odds of MLTSS enrollees responding favorably to the following questions were greater than that of the average question for the access domain: (1) proportion of people who have transportation to get to medical appointments when they need to (ACCESS_1B, OR = 1.94, PP = 100%), (2) proportion of people who have a specialized bed and do not need an upgrade (ACCESS_2C, OR = 1.67, PP = 98%), and (3) proportion of people who have a wheelchair and do not need an upgrade (ACCESS_2K, OR = 1.76, PP = 99%). In addition, the odds of MLTSS enrollees responding favorably to the following questions were more favorable than other questions in the safety and service coordination domains: (1) proportion of people who are able to get to safety quickly in case of an emergency like a fire or a natural disaster (SAFETY_5A, OR = 1.57, PP = 97%) and (2) proportion of people whose services meet all their needs and goals (SVCCDN_4A, OR = 1.42, PP = 94%).

Figure IV.2. Odds of MLTSS enrollees responding favorably on NCI-AD survey items, compared to FFS beneficiaries
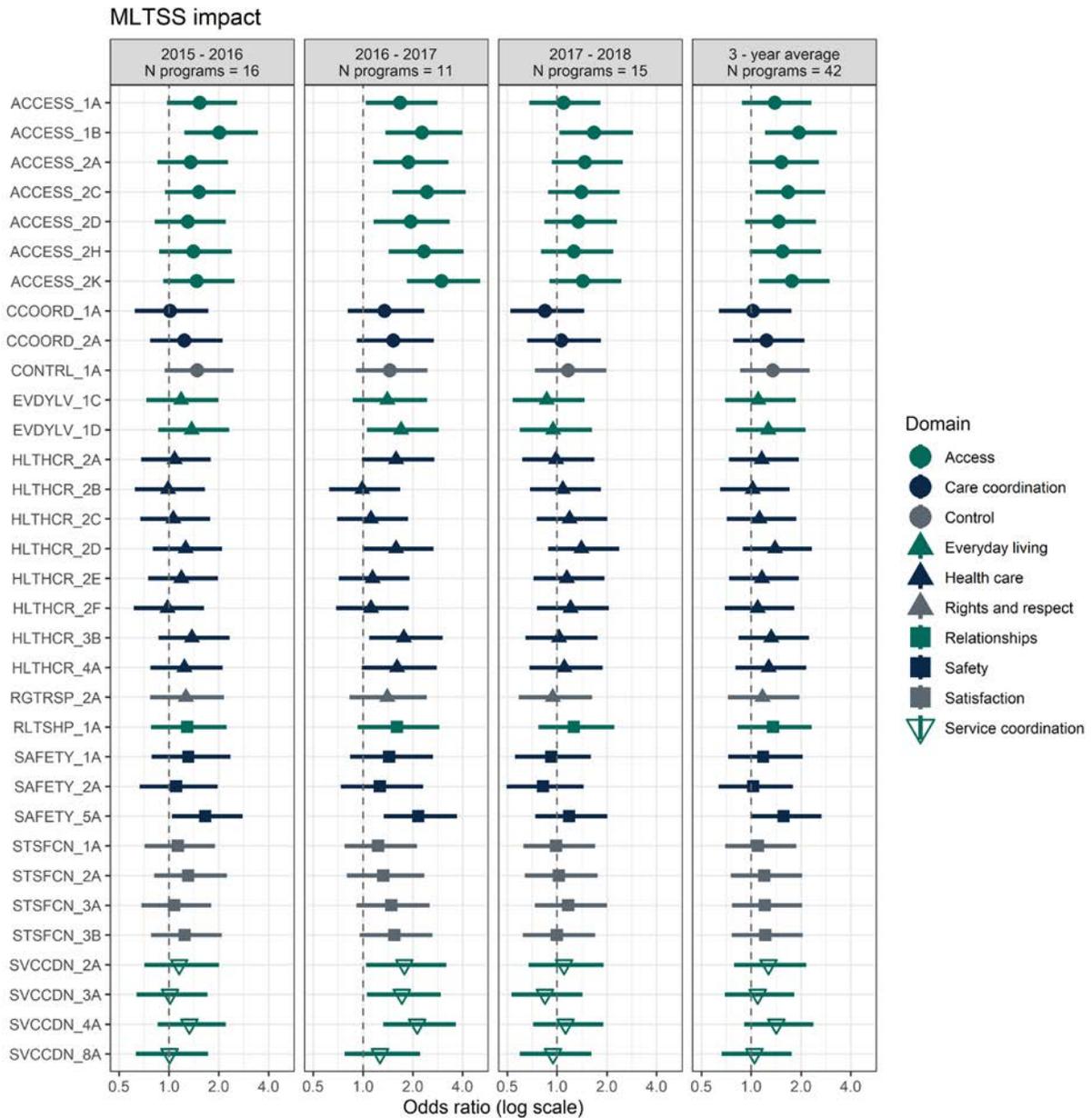
FFS = fee-for-service; MLTSS = managed long-term services and supports; N = number; NCI-AD = National Core Indicators-Aging and Disabilities.

In the domains of access, control, relationships, health care, and satisfaction, MLTSS enrollees had consistently better odds of responding more favorably than FFS beneficiaries across all three survey waves. However, there were also several domains and items in which outcomes in one survey wave differed from the other two, as well as the three-year average. Specifically, in the domains of care coordination, everyday living, rights and respect, and safety, MLTSS enrollees had worse odds of responding favorably in the third survey wave, despite better odds in the first two waves. Such trends were the result of less favorable responses for MLTSS enrollees in the following survey items: (1) proportion of people who reported feeling comfortable and supported enough to go home after being discharged from a hospital or rehabilitation facility (CCORD_1A, OR = 0.84, PP = 24%), (2) proportion of people who always get enough assistance with everyday activities when they need it (EVDYLV_1C, OR = .86, PP = 26%), (3) proportion of people who always get enough assistance with self-care when they need it (EVDYLV_1D, OR = .95, PP = 39%), (4) proportion of people who feel that their paid support staff treat them with respect (RGTRSP_2A, OR = .94, PP = 38%) (5) proportion of people who feel safe at home always or more of the time (SAFETY_1A, OR = .92, PP = 36%), and (6) proportion of people who always feel safe around their paid support staff (SAFETY_2A, OR = .82, PP = 22%).

C. Limitations

Though the NCI-AD analysis suggests positive impacts of MLTSS programs on enrollees, our findings are subject to several methodological limitations. First, because we examined 33 of more than 100 survey items, it is possible that our findings are specific to the items that we assessed and might not hold for the remainder of the survey items. However, we discussed our approach with the survey sponsors, who agreed that the subset of items we selected were the most relevant to MLTSS programs. Second, we collapsed response options into a smaller number of mutually exclusive categories to aid in our analysis. In most cases, we use collapsing rules that (1) followed the rules HSRI used in its national reports and (2) evenly weighted responses options for each item across the combined sample (see Appendix Table C.3 for collapsing rules). However, it is possible that the coding of the data inadvertently biased results. Third, our analysis pooled survey results across MLTSS and FFS programs; although we controlled for several demographic, state and programmatic differences, it is possible that unobserved factors influenced the results. Last, we analyzed aggregate state program-level survey results, rather than beneficiary-level responses, so we were unable to adjust for beneficiary-specific characteristics, such as health or functional status.

Our findings are also subject to limitations common to other beneficiary surveys in which subjective responses result in differences that, when measured in absolute terms, may or may not reflect real differences in individuals' experience of care or quality of life. For example, the absolute difference in the proportion of people who can get an appointment to see their primary care doctor when they need to was 4 percentage points (85 percent of MLTSS enrollees responded "yes, always" compared to 81 percent of FFS beneficiaries with the same response), with a posterior probability of 99 percent. However, the subjective assessment of need among individuals in each group may have swayed the results.

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V. FINDINGS IN CONTEXT: SUMMARY, DISCUSSION, LIMITATIONS, AND CONCLUSIONS

A. Summary and discussion of findings

As more states have turned to managed care delivery for Medicaid beneficiaries eligible for LTSS, it is important to understand how costs and beneficiary outcomes for MLTSS enrollees differ from those receiving LTSS through traditional FFS delivery systems. In particular, it is important to understand how beneficiaries enrolled in MLTSS programs compare to FFS on access to services, beneficiary experience, and quality of life.

In this evaluation, we addressed five research questions: (1) how does Medicaid MLTSS spending change over time; (2) how does service use compare between MLTSS and FFS systems; (3) how does the quality of care compare between MLTSS and FFS systems; (4) how does self-reported access to care compare between MLTSS and FFS systems; and (5) how does self-reported beneficiary experience and quality of life compare between MLTSS and FFS systems? Table V.1 summarizes the major findings from this evaluation, excluding spending trends. The rest of the section recaps major findings and discusses their meaning. For findings on service use and quality of care, we present evidence from the three states we evaluated using a matched comparison group design separately from the two states evaluated with an unmatched design because evidence from the former is more rigorous. The section concludes with implications and recommendations for future studies on MLTSS program effects.

Table V.1. Summary of findings on service use, quality of care, access, beneficiary experience, and quality of life

Outcome, by research domain / Population	MLTSS program-level findings						MLTSS pooled findings
	Florida		Kansas		Tennessee		
	DUALS	MCAID	DUALS	MCAID	DUALS	MCAID	
Service use							
Nursing facility use	✔	🚫	✔	✔	🚫	🚫	-
HCBS use, overall	✔	🏴	🚫	✔	🏴	🏴	-
Inpatient hospital days	-	✔	-	✔	-	🚫	-
HCBS use, by service category:							
Round-the-clock services use	✔	✔	✔	🚫	🚫	🚫	-
Day services use	✔	🏴	✔	✔	🚫	🚫	-
Home-delivered meals use	🚫	🚫	🚫	🚫	🚫	🚫	-
Home-based services use	✔	🚫	✔	✔	🚫	🚫	-
Caregiver support services use	✔	✔	🚫	🚫	🏴	🏴	-

Table V.1 *(continued)*

Outcome, by research domain / Population	MLTSS program-level findings						MLTSS pooled findings
	Florida		Kansas		Tennessee		
	DUALS	MCAID	DUALS	MCAID	DUALS	MCAID	
Equipment, technology, and modifications use	✔	⚑	🚫	🚫	🚫	✔	-
Quality of care							
Potentially avoidable hospitalizations	-	✔	-	✔	-	✔	-
Access, beneficiary experience, and quality of life							
Overall	-	-	-	-	-	-	✔
Access	-	-	-	-	-	-	✔
Care coordination	-	-	-	-	-	-	⚑
Control	-	-	-	-	-	-	✔
Everyday living	-	-	-	-	-	-	⚑
Health care	-	-	-	-	-	-	✔
Rights and respect	-	-	-	-	-	-	⚑
Relationships	-	-	-	-	-	-	✔
Safety	-	-	-	-	-	-	⚑
Satisfaction	-	-	-	-	-	-	✔
Service coordination	-	-	-	-	-	-	⚑

Legend: Cells with ✔ indicate a favorable estimate for MLTSS across all years, cells with 🚫 indicate an unfavorable estimate for MLTSS across all years, and cells with ⚑ indicate mixed results for MLTSS across years. Cells with "-" indicate the outcome was not evaluated for the particular program or population. A favorable estimate for nursing facility use is lower nursing facility use among the MLTSS group, a favorable estimate for HCBS use and all categories of HCBS is higher HCBS use among the MLTSS group, a favorable estimate for inpatient hospital days is lower number of days among the MLTSS group, and a favorable estimate for potentially avoidable hospitalizations is lower potentially avoidable hospitalizations among the MLTSS group. A favorable estimate for all access, beneficiary experience and quality of life indicators is a more positive response for the MLTSS group.

DUALS = dually eligible enrollees; HCBS = home and community-based services; MCAID = Medicaid-only enrollees MLTSS = managed long-term services and supports.

Note: Programs included for program-level estimates for service use and quality of care are the Florida Statewide Medicaid Managed Care Long-Term Care Program, Kansas KanCare (MLTSS component), and Tennessee TennCare CHOICES in Long-Term Care programs. New Mexico Centennial Care Program (MLTSS component) and New York MAP programs are not included in this table because they did not include a matched comparison group in this evaluation. Programs included in the MLTSS pooled estimates for access, beneficiary experience, and quality of care include Delaware, Kansas, Minnesota, New Jersey, Tennessee, Texas, and Wisconsin.

1. **Spending**

Findings and discussion. In 2017, the 10 MLTSS programs featured in the claims and/or survey analysis (that is, our study states) represented a sizeable portion of national MLTSS enrollment (53 percent, Table II.2) and total MLTSS spending nationwide (79 percent, Table A.1). We found that both study and non-study states spent a greater portion of their total MLTSS expenditures on HCBS than institutional LTC, but the study states spent a higher share on HCBS on average (68.9 percent) than non-study states (56.3 percent) in 2017 (the final year of both the claims and survey analyses), and the balance of MLTSS spending in individual states varied greatly. Due to differences in state program features (Table II.1) and data limitations (discussed in Section V.B), rebalancing trends we observed in the expenditures data cannot be generalized to MLTSS programs excluded from the study. Moreover, while some states have reported a positive impact of MLTSS on rebalancing for the LTSS system overall (Dobson et al. 2017), our study was unable to attribute MLTSS programs to overall trends in rebalancing because we were unable to implement a study designed to estimate the impact of MLTSS on rebalancing, in part due to these same data limitations.

2. **Service use and quality of care**

a.   Findings from three states evaluated using a matched RCS design

Nursing facility use. Only Kansas's program showed lower nursing facility use among MLTSS enrollees compared to FFS beneficiaries in all study years; Florida showed lower nursing facility use among dual eligibles only, whereas Tennessee showed higher nursing facility use among both dually eligible and Medicaid-only enrollees in all study years. Nursing facility use declined for dual eligible and Medicaid-only enrollees in Florida but declined only slightly for Medicaid-only enrollees in Kansas and Tennessee.

HCBS use. Compared to FFS beneficiaries, use of HCBS among MLTSS enrollees was higher for dual eligible enrollees in Florida and Medicaid-only enrollees in Kansas in all study years. However, use of HCBS was lower for dual eligible enrollees in Kansas and both populations in Tennessee. Unlike nursing facility use, the patterns of HCBS use remained relatively steady over time for most populations in the three study states, although there was an increase in HCBS use among Medicaid-only enrollees in Florida and a decrease among Medicaid-only enrollees in Tennessee. Findings for all other categories of HCBS were mostly mixed across programs, with the exception of home-delivered meals, which generally indicated unfavorable results for MLTSS enrollees. Though our study attempted to control for differences in covered HCBS between MLTSS and FFS comparison states, findings at the HCBS category level may highlight service differences in the breadth of service cover across states, or data identification differences that we were unable to address through our standardized approach to outcome measures across states.

Inpatient hospital days and potentially avoidable hospitalizations. Across all study years, Medicaid-only enrollees in both Florida and Kansas had lower inpatient days compared to FFS

beneficiaries, although Medicaid-only enrollees in Tennessee had more inpatient days compared to FFS beneficiaries. For the quality of care measure—potentially avoidable hospitalizations—Medicaid-only enrollees in all three study states and years had fewer admissions than those in the FFS comparison group.

b.   Findings from two states evaluated using an unmatched RCS design

Nursing facility use. In New Mexico, nursing facility use declined over time for both dually eligible and Medicaid-only populations, but there was a decline in use of most services over time, so it is unclear whether these findings are driven by data issues or unobserved factors. For New York, nursing facility use was steady over the analysis period.

HCBS use. New Mexico also showed a decline in HCBS use over time, but this trend was observed across most measures, so the interpretation of these patterns is unclear. Similar to the trends observed in nursing facility use, HCBS use in New York was steady over the analysis period. There was also low use of home-delivered meals in both the New Mexico[34] and New York programs. These findings suggest that MLTSS programs may not use home-delivered meals for their enrollees, on average, to the extent that FFS states do for their populations with LTSS needs. Because we calculated measures of HCBS service use in these two states in isolation (that is, without a matched comparison group), it difficult to attribute these findings to MLTSS; however, the finding is consistent with our finding in the three states with matched comparison groups.

Inpatient hospital days and potentially avoidable hospitalizations. Among Medicaid-only enrollees, New Mexico showed declines in both inpatient hospital use and potentially avoidable hospitalizations; the latter dropped substantially between the first and second study years (2014 and 2015). We did not calculate these measures for New York's MAP program, which enrolls only dually eligible enrollees and therefore is not responsible for covering hospital care.

c.   Discussion

Our study found that the effects of MLTSS on nursing facility use, HCBS use, and hospitalizations varied over time, and across states and populations—findings consistent with other studies that have evaluated service use and quality of care for MLTSS enrollees. For example, the interim evaluation found that in New York and Tennessee, there was an increase in personal care use and any HCBS use just for Medicaid-only beneficiaries, but a decrease in HCBS use for dual eligibles in Tennessee. The interim evaluation also found an insignificant change in institutional care in Tennessee, while in New York enrollees experienced a decrease in institutional care use for LTSS. Hospital use among MLTSS enrollees increased in Tennessee but decreased in New York (Libersky et al. 2018). Other state-specific evaluations have also

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[34] New Mexico does not require that MLTSS plans cover home-delivered meals; however, some plans offer meals as a value-added service.

found mixed results across a range of outcomes (Grabowski 2006; JEN Associates 2015; Texas Health and Human Services Commission 2017; Deloitte 2017).

Mixed findings across states and populations on these measures could be due to myriad factors, including differences in state program design, differences in the level of functional need or other characteristics of enrollees in the study and comparison states, and data quality problems and difficulty identifying comparison groups.

3. Self-reported access to care, beneficiary experience, and quality of life

Findings. Because people who receive LTSS typically have chronic conditions and their functional ability is likely to decline over time due to the nature of their disability or age, access to needed services, experience of care, and quality of life are among the most important measures of program quality (MACPAC 2018; NQF 2016). By using three years of standardized survey data across states, we were able to systematically compare these outcomes for MLTSS and FFS populations. We found that, on average, MLTSS enrollees had 28 percent higher odds of responding favorably to questions related to experience of care and quality of life compared to FFS beneficiaries (OR = 1.28; Appendix Table B.4). Averaged across the three survey waves, measures in all 10 domains examined showed more favorable responses among MLTSS enrollees; however, only measures in four domains (access, control, relationships, and satisfaction) favored MLTSS in all three survey years (Table V.1). Responses among MLTSS enrollees were most consistently favorable on questions related to self-reported access to care, particularly for transportation to get to medical appointments and having needed equipment in the home.

Discussion. Though we are not aware of other cross-state studies of the effects of MLTSS on access to care or quality of life, our findings are consistent with a 2017 survey of Medicaid agency staff who reported on the motivations for MLTSS and its perceived effects (Dobson et al. 2017). The report asserted that the "seamless experience of care" produced by strong care coordination requirements and an enhanced array of services is a primary mechanism for improving quality of life. It also reported that most states use MLTSS programs to expand access to HCBS (Dobson et al. 2017); our findings that measures of access were more favorable among MLTSS enrollees suggest that efforts to expand access have been fruitful.

B. Limitations

There are a number of limitations to note across our analyses. Major issues that restricted our analysis and limitations that should be considered when interpreting our findings are as follows:

- **Trends in spending within states over time and across states should be interpreted with caution.** We originally proposed to explore how MLTSS spending changed over time and varied by MLTSS program features by evaluating two measures of spending: (1) MLTSS expenditures by service category and (2) Medicaid MLTSS expenditures per user. However, we observed several issues with the quality of the CMS LTSS Expenditure Report data used

construct these measures; as a result, this evaluation presents only descriptive trends in spending as context for the other claims- and survey-based outcomes we evaluated.

- **Claims-based measures of service use and quality of care were calculated for a limited number of MLTSS programs.** Medicaid encounter data broadly, and LTSS encounter data specifically, have been poorly reported to date. Through our data quality assessment, we identified a number of issues with data quality over time—in particular, in the TAF data time periods—so we needed to drop many states from the analysis due to the severe data limitations. Therefore, our analysis focused on only 5 of 33 possible MLTSS programs.

- **Claims-based findings from the matched RCS design do not control for pre-period trends.** Our intention at the onset of this study was to evaluate the impact of the MLTSS program on outcomes of service use and quality of care by controlling for the effect of state-specific differences not due to MLTSS through the use of a DID design. Unfortunately, such a design was not feasible in any of our states (see Section III.C.2), so we used the next best approach—a matched RCS design—in three study states. Although this design approach controls for national trends that might otherwise affect both MLTSS and FFS states, it does not remove the effect of differences that existed before the start of the program.

- **For the matched RCS design, populations and services covered in the FFS comparison groups do not align perfectly with their MLTSS counterparts.** Even for the three states where we were able to select a comparison group, the groups were imperfect. Also, because we used out-of-state comparison groups wherever we were able to use a matched comparison group for the analysis, we are unable to determine whether there were other environmental factors that influenced the outcomes over time. We also were not able to observe whether there were major data differences between the states that may have influenced differences we observed between the MLTSS states and FFS comparisons within each year. Therefore, there would be no way to disentangle these possible changes from the MLTSS impact, which warrants caution when interpreting the findings. Differences between the groups fluctuated over time, and in many cases, the differences were largest in the first year of our analysis. These changes could be due to differences in data reporting and data quality issues in TAF over time.

- **Unobserved characteristics could influence the claims-based findings.** Furthermore, although we constructed as many beneficiary characteristics as possible from the Medicaid administrative data, we did not have any covariates reflecting other important characteristics of the LTSS population, such as functional limitations or living arrangements. We cannot rule out that there are unobserved factors between the groups or that selection bias impacted our findings.

- **Survey-based findings on self-reported access to care, beneficiary experience, and quality of life could not control for all differences between MLTSS and FFS populations and programs.** Our analysis pooled results across MLTSS and FFS programs, and although we controlled for several demographic, state, and programmatic differences, it is possible that unobserved factors for which we did not control influenced our results. Furthermore, we

had to use program-level, not beneficiary-level data, so we were unable to adjust for beneficiary-specific characteristics, such as health or functional status. We were limited to using the aggregate characteristics reported across programs as part of the survey results. The states used for this analysis differed from those used for the analysis of service use and quality of care, so we cannot make state-specific conclusions across the measures of access to care, beneficiary experience, quality of life, service use, and quality of care examined for the different groups of states. For additional limitations, see Section IV.C.

C. Conclusions

All 10 domains we examined for self-reported access, experience, and quality of life showed more favorable responses for MLTSS enrollees compared to FFS beneficiaries. However, for other outcomes we examined, the findings of this evaluation do not demonstrate conclusively that MLTSS has clear benefits over FFS delivery systems in all states and for all LTSS populations. In some states, for some years, and for certain groups of LTSS beneficiaries, there is greater use of HCBS, lower use of nursing homes and hospital days, and fewer potentially avoidable hospitalizations. However, the results are inconsistent for reasons that are not entirely clear.

More conclusive evidence of the effects of MLTSS—operating in different states and for different populations—relative to FFS depends on several improvements to the data needed to construct a comparable set of measures and outcomes across states for beneficiaries with the same characteristics. Such improvements (identified below) will provide an opportunity to create the foundation of evidence needed to better understand the impact of MLTSS programs on beneficiary outcomes.

- **Consistent data over longer periods of time.** Rigorous evaluations of MLTSS programs, such as those using DID designs, need data sources that are consistent over time to limit the potential for changes in data reporting to affect differences in outcomes across years. They also require consistent and reliable data over many years, before and after MLTSS implementation, to make it possible to see effects that may take longer to occur or that may emerge as programs mature. The recent availability of Medicaid TAF data and improvements to its completeness and reliability in the next several years might help to address the limitations in data available up to this point.

- **Comparable state data on LTSS beneficiaries' characteristics**. To control for differences across states in beneficiary characteristics known to influence the use of HCBS and nursing home admissions, and other key outcomes, it is critical to have information on beneficiaries' functional and cognitive status, as well as living arrangements. Extensive data on health and functional status are collected for all nursing home residents in the Minimum Data Set (MDS), but the creation of a national database with comparable state data for all FFS LTSS users and MLTSS enrollees remains an elusive goal, not addressed by the recent availability of Medicaid TAF data.

- **Detailed information on specific program features.** State-specific evaluations comparing outcomes for MLTSS enrollees to those of FFS beneficiaries can build the evidence on MLTSS effects as long as they use well-matched comparison groups within the state or in other states and control for the full range of characteristics that affect the outcomes. Even so, differences in outcomes across states and populations may be found—indeed they can be expected—due to myriad differences in MLTSS program design and operation, MLTSS plan performance, and state and local environments. States differ in how they set capitation rates and use financial incentives to promote rebalancing toward HCBS and better quality. MLTSS plans differ in the quality of care coordination provided to enrollees. States, as well as regions within each state, vary in the availability of HCBS, direct care workers, and affordable and accessible community-based housing for Medicaid beneficiaries. Understanding how these differences affect key outcomes of MLTSS programs across states and populations requires detailed and comparable information about MLTSS program features and other state and plan initiatives, as well as information about the state and/or local LTSS environment. While some of this information can be collected through various sources, such as program feature information and service coverage from state MLTSS contracts, other information is difficult to obtain or is not readily available for researchers, such as quality improvement initiatives or LTSS provider capacity at the state and/or local levels, and there are no systematic data collection efforts in these areas on the horizon.

Future evaluation work at the state or federal levels depends upon continued progress to address these important data gaps. In addition, as the evidence base on individual MLTSS program effects builds, it is also important to have comparable designs across program-level evaluations to be able to conduct cross-state analyses that can come to broader conclusions about the impacts of MLTSS as a delivery model.

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Appendix A:
Data supporting trends in enrollment and expenditures

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Table A.1. MLTSS expenditures (in thousands of dollars), 2012–2017[a]

State	2012	2013	2014	2015	2016	2017
Total LTSS[b]	**$141,539,160**	**$146,408,393**	**$152,207,913**	**$159,265,839**	**$170,005,819**	**$167,362,036**
Total MLTSS[c, d]	**$8,927,515**	**$12,998,850**	**$20,273,413**	**$27,817,136**	**$35,614,651**	**$37,809,612**
MLTSS as a proportion of total LTSS (percentage)	**6.3%**	**8.9%**	**13.3%**	**17.5%**	**20.9%**	**22.6%**
Included in study	**$6,036,718**	**$9,284,621**	**$15,939,733**	**$20,573,905**	**$26,654,305**	**$29,722,748**
Claims analysis only	**$2,000,421**	**$3,704,548**	**$8,947,462**	**$9,860,068**	**$15,330,040**	**$18,526,783**
Florida[f]	$253,921	$263,983	$2,565,536	$3,643,955	$3,901,077	$3,699,893
New Mexico	NR	NR	$581,273	$973,457	$997,659	$591,612
New York	$1,746,500	$3,440,565	$5,800,653	$5,242,656	$10,431,305	$14,235,278
Survey analysis only	**$2,666,426**	**$3,871,813**	**$4,826,472**	**$8,086,239**	**$8,911,270**	**$9,613,038**
Delaware	-	$338,087	$351,357	$376,527	$389,253	$523,812
Minnesota	$427,993	$415,542	$456,119	$536,174	$620,106	$569,346
New Jersey[e]	-	$344,227	$775,960	$1,066,387	$721,363	$1,122,455
Texas[e]	$1,110,125	$1,915,260	$2,328,642	$5,134,825	$6,259,680	$6,278,637
Wisconsin	$1,128,308	$1,196,784	$1,265,751	$1,348,852	$1,310,121	$1,642,600
Claims and survey analysis	**$1,369,871**	**$1,708,260**	**$2,165,799**	**$2,627,597**	**$2,412,994**	**$1,582,927**
Kansas	-	$370,599	$836,405	$1,090,814	$1,044,843	NR
Tennessee	$1,369,871	$1,337,661	$1,329,394	$1,536,783	$1,368,151	$1,582,927
Not in study	**$2,890,797**	**$3,376,142**	**$3,982,322**	**$6,866,705**	**$8,571,093**	**$7,563,052**
Arizona	$1,521,335	$1,493,242	$1,554,042	$1,591,979	$1,652,549	$1,813,802
California	NR	$20,676	NR	NR	NR	NR
Hawaii[e]	$359,050	$359,050	$346,807	$378,236	$400,012	$401,061
Idaho	-	-	$0	$0	$14,829	$17,997
Illinois	-	$66,212	$424,558	$673,078	$240,481	$363,415
Iowa	-	-	$263,926	$276,914	$900,340	NR
Massachusetts	$439,205	$531,737	NR	$1,203,949	$966,465	NR
Michigan	$429,486	$418,351	$439,667	$854,843	$823,077	$811,884
North Carolina[e]	$138,214	$482,108	NR	NR	$1,108,609	$1,253,462
Ohio	-	-	$825,745	$1,685,144	$1,903,173	$2,276,431
Pennsylvania[e]	$3,507	$4,766	$5,578	$5,562	$5,557	NR
Rhode Island[e]	-	NR	$122,000	$197,000	$556,000	$625,000
Virginia	-	-	-	-	-	NR

"-" denotes a year in which the MLTSS program did not exist in the state. "NR" denotes a year in which the state was not able to report MLTSS expenditures. States reporting "NR" are not included in the MLTSS expenditure total for the year.

LTSS = long-term services and supports; MLTSS = managed long-term services and supports; NR = not reported.

Table A.1 *(continued)*

[a] Sources: 2014–2017: Unpublished MLTSS expenditure data obtained from CMS in Fall 2019. 2013: Eiken et al. 2017. 2012: Eiken et al. 2016. MLTSS expenditures in these reports were self-reported by states. CMS has noted that there may be issues with data accuracy and completeness for some states in the 2014-2017 unpublished data obtained in Fall 2019. Data used for this table were current as of Fall 2019.

[b] Balancing Incentive Payment (BIP) expenditures are not included in the calculation of total LTSS because the program does not increase total expenditures—it increases the federal share of spending.

[c] Data do not include expenditures for managed care programs in the following states in one or more service categories (years of missing data in parentheses): California (2010–2012, 2014–2017); Hawaii (2009, 2010); Iowa (2017); Kansas (2017); Massachusetts (2008, 2014, 2017); New Mexico (2011–2013); North Carolina (2014–2015); Rhode Island (2013); Virginia (2017); and Wisconsin (2017). Michigan 2015 and 2016 data do not include data for the state's smallest managed care program. Michigan 2014 and Texas 2015 data are incomplete because a managed care program started that year; estimates are included starting the following year. Illinois managed care data are incomplete for Medicare/Medicaid program enrollees (2017). Data from Arizona (2014), Florida (2015–2016), Massachusetts (2015–2017), and New Mexico (2015–2016) do not include expenditures for state plan personal care expenditures within a managed care program.

[d] MLTSS expenditures include LTSS costs reported under managed care (including FAI demonstrations and BIP but excluding PACE for states that operate MLTSS programs). MLTSS totals exclude states that do not operate MLTSS programs but reported expenditures for BIP (Indiana, Iowa, Louisiana, and New Hampshire). Some states may include expenditures for items other than capitation payments to managed care plans covering LTSS as part of their reported MLTSS expenditures. Data for several states include expenditures for Medicaid Upper Payment Limit programs or provider taxes. For more detail, see Eiken et al. 2014 and Eiken et al. 2016.

[e] Some state data are based on a different time period than the federal fiscal year. Data for Hawaii (2017), New Jersey (2015–2017), North Carolina (2016–2017), Pennsylvania (2016), Rhode Island (2014–2017), and Texas (2014–2017) are estimates for the corresponding state fiscal year. North Carolina 2016 state-reported data are estimated expenditures for August 2015 through July 2016.

[f] Florida's MLTSS expenditures increased from 2013 to 2014 as a result of mandatory enrollment in statewide managed long-term care as part of the Statewide Medicaid Managed Care (SMMC) Program.

Appendix B:
Data and methods used to evaluate service use and quality of care outcomes

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A. Overview of MLTSS program selection

MLTSS programs selected for the evaluation had to meet the following criteria: operating for more than two consecutive years between 2012–2017, sufficient enrollment for an adequately powered study, and not restricting enrollment to specialized populations for whom it would be difficult to identify an appropriate comparison group. After identifying programs that met these requirements, we assessed the completeness and quality of Medicaid data required to construct the measures of interest, as described in greater detail in Section C below. Figure B.1 illustrates the steps we followed to select the MLTSS programs. The five programs that met the selection criteria and passed data quality checks were Florida Statewide Medicaid Managed Care Long-Term Care Program, Kansas KanCare (MLTSS component), New Mexico Centennial Care (MLTSS component), New York Medicaid Advantage Plus (MAP), and Tennessee TennCare CHOICES in Long-Term Care.

Figure B.1. Steps for MLTSS program selection
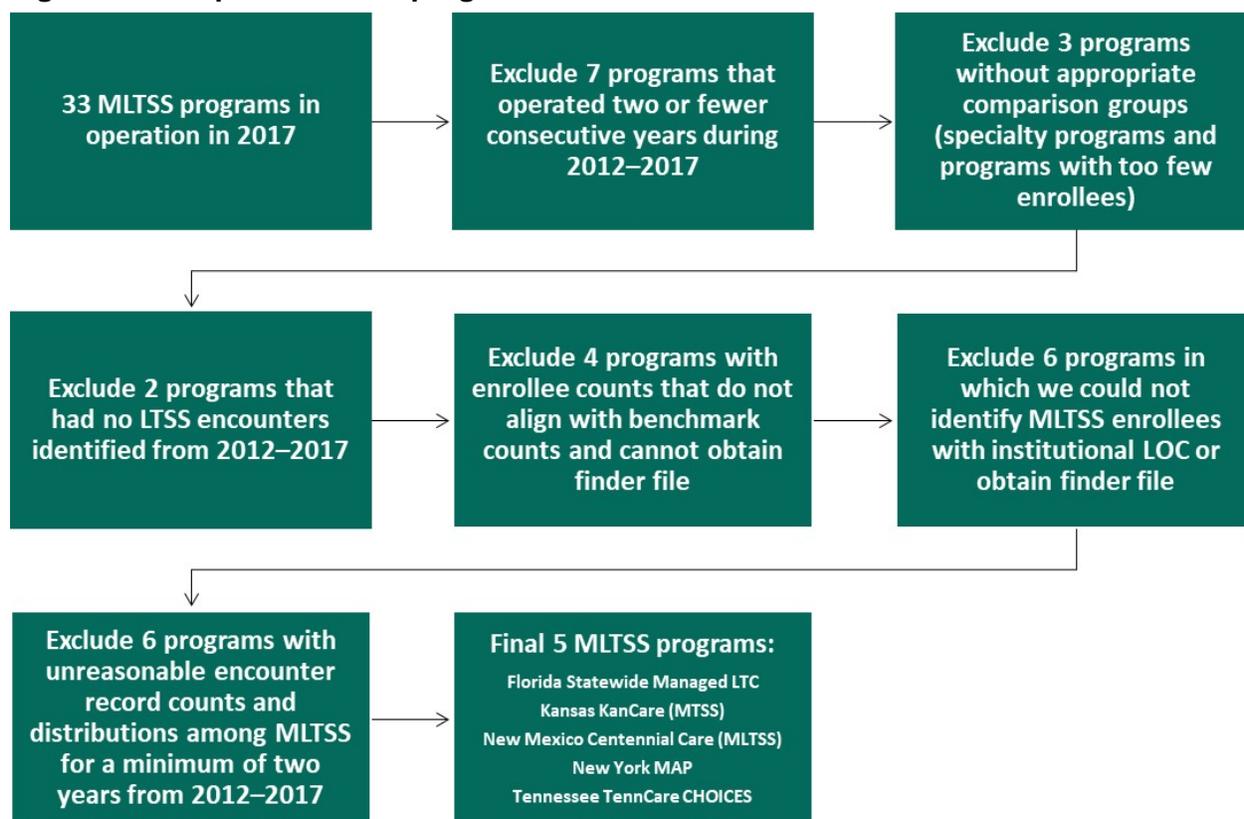
LOC = level of care; LTC = Long-Term Care; LTSS = long-term services and supports; MAP = Medicaid Advantage Plus; MLTSS = managed long-term services and supports.

B. Data

1. Data sources

a. Medicaid administrative data

For our claims-based analyses, we used a combination of national Medicaid administrative data sources, including the Medicaid Analytic eXtract (MAX), Alpha-MAX, and the Transformed Medicaid Statistical Information System (T-MSIS) Analytic File (TAF) data.[35] Our planned study period (2012–2017)[36] covers the time when the retired MSIS was replaced by T-MSIS as the national, uniform, and comprehensive data collection system for Medicaid and the Children's Health Insurance Program (CHIP). For periods before a state's transition from MSIS to T-MSIS, we used MAX, or the early version of MAX, known as Alpha-MAX, which does not require as many quarters of run-out for claims adjustments. For periods after a state's transition, we used TAF. MAX and Alpha-MAX are both research versions of state MSIS submissions; TAF is a research version of state T-MSIS submissions. The data used for our analysis were current as of Fall 2019.

The exact data source varied by state and year, depending on data availability and when each state transitioned its data systems. Table B.1 provides a list of each data source for our study period for the states included in our claims-based outcomes evaluation, including states used as FFS comparisons for our MLTSS programs. Most states had data available throughout our entire study period, although a few were missing some years or months. Furthermore, all states faced issues with run-out months for claims adjustment in Alpha-MAX immediately preceding the date that the state transitioned to T-MSIS reporting. In Section C.2 of this appendix, we describe our approach for selecting the states included in the evaluation based on data availability, completeness, and quality. As described in Section C.1.a, we ultimately limited our evaluation to TAF time periods due to differences in the outcome measures that corresponded to the underlying data source (MAX/Alpha-MAX or TAF).

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[35] CMS required that states transition from reporting Medicaid administrative data from MSIS (the source of MAX and Alpha-MAX data) to T-MSIS (the source of TAF data) beginning in 2014; however, actual dates of transition varied by state. See Table B.1 for more information on data availability by source.

[36] We originally intended our outcomes evaluation to cover 2012–2017, with 2011 data used to define baseline measures for matching and covariates for the 2012 evaluation year. However, due to major changes in the outcome measures over time, we ultimately restricted our evaluation period to TAF time periods.

Table B.1. Medicaid administrative data source used for evaluating claim-based outcome measures, by state and year

State	2011	2012	2013	2014	2015	2016	2017
MLTSS states							
Florida	MAX	MAX	Alpha-MAX	TAF	TAF	TAF	TAF
Kansas	MAX	Alpha-MAX	-	TAF	TAF	TAF	TAF
New Mexico	MAX	MAX	Alpha-MAX	TAF	TAF	TAF	TAF
New York	MAX	MAX	MAX	Alpha-MAX	Alpha-MAX + TAF	TAF	TAF
Tennessee	MAX	MAX	MAX	MAX	Alpha-MAX + TAF	TAF	TAF
FFS comparison states							
Georgia	MAX	MAX	MAX	MAX	Alpha-MAX + TAF	TAF	TAF
Oklahoma	MAX	MAX		Alpha-MAX + TAF	TAF	TAF	TAF
South Carolina	MAX	MAX	Alpha-MAX	Alpha-MAX + TAF	TAF	TAF	TAF

Note: Although we originally intended to evaluate outcomes from 2012–2017, upon exploring the data, we discovered clear differences in the way outcomes were defined in MAX as compared to TAF. Therefore, our final outcome evaluation uses only TAF data. See Section C.1.a of this appendix for details.

"-" indicates MAX/Alpha-MAX/TAF data were unavailable.

FFS = fee-for-service; MAX = Medicaid Analytic eXtract; MLTSS = managed long-term services and supports; TAF = T-MSIS Analytic File.

b.   Medicare administrative data

For beneficiaries in our sample who were dually eligible, we also used Medicare administrative data to supplement the Medicaid data for demographic and chronic condition variables.[37] In particular, we used the Medicare Beneficiary Summary File (MBSF) Base, Chronic Conditions Segment, and Other Chronic or Potentially Disabling Conditions Segment from 2011–2017 to develop matching and control variables for our analyses. Section B.4 of this appendix includes more details on the variables used for our analyses.

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[37] We did not assess the quality of the Medicare data used for our analyses.

c.   Use of state finder files to identify MLTSS enrollees meeting an institutional level of care

Several states did not have sufficient information in MAX or TAF to identify MLTSS enrollees and/or identify enrollees who met an institutional level of care (LOC).[38] Therefore, to help define our sample, we obtained finder files to identify MLTSS enrollees in Kansas, New Mexico, and Tennessee. Finder files from New Mexico and Tennessee also helped identify the subset of MLTSS enrollees who met an institutional LOC, whereas Kansas requires an institutional LOC for all enrollees.

Although the New York MLTC Partial Capitation program was included in the interim evaluation, we were unable to obtain a finder file for this program to limit the New York MLTC enrollees to those with an institutional LOC; therefore, we were unable to include this program in our summative evaluation. Because we could not obtain a finder file, we focused our New York evaluation on MAP enrollees, who are required to meet an institutional LOC to enroll in the program, so no finder file was needed for this program. We used relevant plan identification numbers from the Medicaid administrative data to identify MAP enrollees.

The last program included in the evaluation—the Florida Statewide Medicaid Managed Care Long-Term Care Program—did not require a finder file to identify enrollees or to make LOC sample limitations because the program requires enrollees to have an institutional LOC. We used relevant waiver identification numbers from the Medicaid administrative data to identify MLTSS enrollees in Florida.

2.   Medicaid administrative data quality assessment

a.   Overview of data quality assessment approach

As described above in Section A of this appendix, we first eliminated MLTSS programs operating for two or fewer years between 2012–2017, with too few enrollees, or for highly specialized populations for which it would be difficult to identify an appropriate comparison group. After these restrictions, our program selection was based on data quality assessment of the MAX/Alpha-MAX and TAF for each relevant state.

Because service use for LTSS covered under managed care is contained in encounter records, which historically have been poorly reported by states, our data quality review needed to pay special attention to encounter data quality in both MAX/Alpha-MAX and TAF. For each state and relevant time period covering 2012–2017, we used an approach similar to the MAX/Alpha-

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[38] All MLTSS programs enroll people with an institutional LOC, but many programs also extend eligibility to those with low or no need for functional support. People with an institutional LOC are all required to demonstrate some level of need for functional support, resulting in a higher probability of needing institutional or community-based LTSS, compared to people with little or no need for functional support. For this reason, this evaluation examines only those who met institutional LOC in both MLTSS programs and comparison FFS populations. This sample limitation was also needed to identify an appropriate FFS comparison group for the MLTSS enrollees because it would otherwise be difficult to identify an appropriate comparison for MLTSS enrollees with little or no need for functional support who may or may not use any LTSS.

MAX data quality analysis conducted for the interim evaluation report (Libersky et al. 2018). We conducted the following steps:

1. Identified states and time periods that had more than one encounter record for LTSS (home- and community-based services [HCBS] and institutional services) reported in each year during the study period. We excluded states without any LTSS encounter records from the claims-based outcome evaluation.

2. Among remaining states, we checked the number of beneficiaries identified as MLTSS enrollees against external benchmarks derived from the Medicaid managed care enrollment data reported on data.Medicaid.gov and in Lewis et al. 2018. We excluded states with reported MLTSS enrollment in MAX/Alpha-MAX/TAF that differed by more than 30 percent from reported MLTSS enrollment in other sources or states for which we could not obtain finder files to identify enrollees.

3. Among remaining states where individuals who do not meet an institutional LOC were allowed to enroll in MLTSS (specifically, people who are dually eligible or require a less than institutional LOC can enroll), we examined the quality of LOC status reporting in TAF. We excluded states for which we could not identify the correct proportion expected to meet an institutional LOC, based on enrollment and user counts from the Medicaid managed care enrollment data and Lewis et al. 2018, or where we could not obtain a finder file for this purpose.

4. Among remaining states, for the identified MLTSS enrollees in each state, we examined the percentage of enrollees who had at least one HCBS or institutional care encounter record in each study year. We excluded states where enrollees had too few LTSS encounters relative to benchmarks calculated from FFS states or relative to in-state time trends.

5. Among remaining states, we examined the quality of the data fields on HCBS and institutional care encounter records required to construct the claims-based outcome measures identified above. We excluded states with encounter data in which key data fields required to measure the majority of the claims-based outcome measures were of poor quality, based on various annual measures of HCBS and nursing facility service use.[39]

In addition to checking data quality for MLTSS states and time periods eligible for our study, we also conducted data quality assessments on the universe of potential FFS states for the relevant years of TAF data (spanning 2014 to 2017, depending on the state). Given the major change in data reporting and structure with the transition to T-MSIS, it was necessary to validate data quality for FFS states in TAF before proceeding with comparison group selection for the final MLTSS programs. The FFS data TAF quality checks included the following steps:

1. **Checking enrollment counts in Medicaid Section 1915(c) waivers and enrollment characteristics**. We excluded states with counts of 1915(c) waiver enrollees that differed by

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[39] They included measures such as the proportion of short-term (0-–21 days), medium-term (22-–100 days), and long-term (101 or more days) nursing facility users each year, and the average length of stay for each stay type.

greater than 50 percent from reported 1915(c) waiver enrollees from other sources (Amos et al. 2018 and state reports) or with unexpected enrollment characteristics.

2. **Checking institutional care claims**. We excluded states with institutional care claims that differed from expected counts and distributions or with unexpected time trends.

3. **Checking HCBS claims and claims for waiver enrollees**. We excluded states with HCBS claims that differed from expected counts and distributions based on waiver enrollment or with unexpected time trends.

b.   Final MLTSS program selection for evaluation

The five programs included in our evaluation passed the data quality checks for the LTSS-related data for a minimum of two years of the analysis period (Figure B.1). These programs include the Florida Statewide Medicaid Managed Care Long-Term Care Program, Kansas KanCare (MLTSS component), New Mexico Centennial Care (MLTSS component), New York Medicaid Advantage Plus (MAP), and Tennessee TennCare CHOICES in Long-Term Care.

Although these programs passed the data quality checks described above, there were still a number of overarching data issues that spanned all states, which ultimately impacted our final analysis periods and study designs. These issues included significant changes in the type of service coding in TAF data relative to MAX/Alpha-MAX and run-out issues in the last quarter of Alpha-MAX data before each state transitioned to TAF.

3.   Defining service use and quality of care outcome measures

We constructed 10 claims-based measures that reflect service use and quality of care outcomes using a combination of codes from MAX and TAF data (Table B.2). The approach for defining these measures is described below.

Table B.2. Identification of service use and quality of care outcome measures in Medicaid administrative data

Outcome	File	MAX data elements	TAF data elements
Service use			
Nursing facility use	LT	• Type of service: 07	• Type of service: 009, 047, 059
HCBS use	OT	• Type of service: 13, 30, 33, 38, 52, 54 or • Taxonomy:[a] 02, 04, 05, 06, 07, 08, 09, 12, 14, 16	• Type of service: 016, 017, 018, 019, 020, 021, 022, 043, 051, 063, 064, 065, 066, 067, 068, 069, 070, 071, 072, 073, 074, 075, 076, 078, 079, 080, 081, 082, 083, 115 or • Taxonomy:[a] 02, 04, 05, 06, 07, 08, 09, 12, 14, 16
Round-the-clock services use	OT	• Taxonomy:[a] 02	• Taxonomy:[a] 02
Day services use	OT	• Type of service: 54 or • Taxonomy:[a] 04	• Type of service: 066, 070, 081 or • Taxonomy:[a] 04
Home-delivered meals use	OT	• Taxonomy:[a] 06	• Taxonomy:[a] 06
Home-based services use	OT	• Type of service: 13, 30 or • Taxonomy:[a] 08	• Type of service: 017, 051, 063, 064, 065, 078, 079, 080 or • Taxonomy:[a] 08
Caregiver support services use	OT	• Taxonomy:[a] 09	• Type of service: 068, 071, 082 or • Taxonomy:[a] 09
Equipment, technology, and modifications use	OT	• Taxonomy:[a] 14	• Type of service: 072 • Taxonomy:[a] 14
Inpatient hospital days	IP	• Type of service: 01	• Type of service: 001, 060, 090, 091, 092, 093
Quality of care			
Potentially avoidable hospitalizations	IP	• Type of service: 01	• Type of service: 001, 060, 090, 091, 092, 093

Note: Inpatient hospital days and potentially avoidable hospitalizations were constructed just for Medicaid-only beneficiaries. Because the New York MAP program enrolled only dual eligibles, these outcomes were not evaluated in New York.

HCBS = home- and community-based services; IP = inpatient; LT = long-term care; MAX = Medicaid Analytic eXtract; OT = other services; TAF = T-MSIS Analytic File.

[a] HCBS taxonomy codes listed reflect the first two digits of the HCBS taxonomy coding. There are five digits in the HCBS taxonomy coding.

Nursing facility use. For the dichotomous monthly nursing facility service use measure, we used the Medicaid LT file to identify whether beneficiaries had any claims or encounter records indicating nursing facility services within a particular month.[40] If a claim spanned more than one month, we flagged each relevant month the stay spanned.

HCBS use. Beginning in 2010, the HCBS taxonomy was applied to FFS HCBS claims submitted under 1915(c) waivers as part of the MAX production process. This process changed with the switch to T-MSIS; states now are supposed to populate this data element as part of their data submissions.[41] However, most states have not populated this data element in TAF to date. In addition, no taxonomy codes were available on encounter records if they were not specifically flagged as a 1915(c) program service (even if the state operated a concurrent 1915(c) MLTSS program). Therefore, we needed to replicate the methodology that MAX uses to apply the HCBS taxonomy to all FFS claims and encounter records in all years of our analysis to attempt to define our HCBS use measures consistently across states and time periods. We manually added the HCBS taxonomy to *all* Medicaid claims and encounters in the MAX and TAF other services (OT) files using the most up-to-date taxonomy crosswalk and incorporating state-specific codes where relevant.[42]

After applying the HCBS taxonomy to the OT files, we defined the monthly dichotomous HCBS use measures using a combination of type of service and taxonomy codes from the claims and encounters (Table B.2). We flagged relevant services if the claim or encounter contained either the relevant type of service or taxonomy code. Round-the-clock services use; day services use; home-delivered meals use; home-based services use; caregiver support services use; and equipment, technology, and modifications use were subsets of the overall HCBS use measure.

It is important to note that although we attempted to make the definitions of HCBS use as consistent as possible across the MAX and TAF time periods, there were major changes to data elements and codes in TAF that made it difficult to do so. Therefore, it is possible that the definitions of the HCBS measures are substantively different between the time periods based on MAX versus TAF. We found evidence of these differences when we examined outcome plots over time to determine whether the parallel trends assumption was valid, preventing us from using difference-in-differences (DID) models for any states; we describe this approach further in Section C.1.a in this appendix.

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[40] We did not include crossover claims for dual eligible beneficiaries, so the measure includes only relevant services for dually eligible and Medicaid-only beneficiaries paid **fully** by Medicaid. Although we did not include any Medicare-paid post-acute days, we were otherwise unable to distinguish between post-acute and custodial nursing facility days paid fully by Medicaid, so the outcome measure reflects any Medicaid nursing facility use.

[41] See T-MSIS Data Dictionary available at: https://www.medicaid.gov/medicaid/data-systems/macbis/transformed-medicaid-statistical-information-system-t-msis/index.html.

[42] We did not limit our taxonomy coding to 1915c program services, so we measured any relevant HCBS use provided under any Medicaid authority.

Inpatient hospital days. We used the Medicaid IP file to construct inpatient stays and calculated the number of days in an inpatient setting in each month.[42] If stays spanned multiple months, we allocated the appropriate number of days to the relevant months for the stay. If there was more than one stay within a month, we calculated the total number of unique days spent in an inpatient setting across all stays that occurred in the month. As we discuss in Section C.5 of this appendix, the monthly data were then annualized for analysis.

Preventable hospitalizations. We used diagnosis and procedure codes from the inpatient stays constructed for the inpatient hospital days measure to identify preventable hospitalizations. We applied the Agency for Healthcare Research and Quality (AHRQ) PQI #90 software to these stays to flag potentially avoidable hospitalizations due to an ambulatory care-sensitive condition. If a stay spanned more than one month, we flagged each relevant month it spanned. Although we defined the outcome to be dichotomous at the monthly level and analyzed it using logistic regression, because the outcome is rare, we did not display results as monthly probabilities (Tables III.3 to III.5). Rather, we multiplied the probabilities by 1,000 to present them as the expected number of months with a potentially avoidable hospitalizations per 1,000 beneficiary months.

a.   Defining characteristics for matching and regression adjustment

We defined a number of characteristics (Table B.3) for the samples we used (1) for matching for Florida, Kansas, and Tennessee, and (2) as covariates in our regression models for all states.

We defined the demographic characteristics for each month based on Medicaid administrative data. We also used the Medicare MBSF Base file to define an indicator for Medicare managed care status at a yearly level. We imputed missing data at the monthly level for these variables using the last observation carried forward.

For the Chronic Conditions Data Warehouse (CCW) indicators, we used Medicaid claims and encounter records for 12-month look-back periods to define conditions from the Medicaid data. For dual eligibles, we also pulled the CCW indicators from the Medicare MBSF Chronic Conditions Segment and Other Chronic or Potentially Disabling Conditions Segment for each relevant year. We then combined the CCW indicators we developed from Medicaid data and the additional ones pulled from the Medicare data for dual eligibles to create flags for each of the CCW indicators for each beneficiary. We did not include learning disabilities, other developmental delays, muscular dystrophy, spina bifida and other congenital anomalies of the nervous system, cystic fibrosis and other metabolic developmental disorders, viral hepatitis, and migraine and other chronic headache because there were too few beneficiaries in our sample with these conditions. Because the CCW indicators available from the MBSF for dual eligibles were limited to specific time points (end-of-year, mid-year), we used the indicators that were as close as possible to the start of each program year for each respective MLTSS program. For example,

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[42] For Georgia, we also applied an exclusion in TAF to drop outpatient claims because the state had erroneously included some outpatient claims in the TAF IP file.

if the MLTSS program years started in January, we used the prior year end-of-year indicators, which would reflect the experience in the 12 months before the program year. We also aligned the time periods used for the Medicaid condition construction to those pulled for the Medicare indicators; that is, if the prior year end-of-year indicators were pulled from the Medicare MBSF, we used claims for the same 12 months to construct the Medicaid indicators for each program year. We aligned the time periods for comparison states to those for the respective matched MLTSS programs.

Table B.3. Matching characteristics and covariates

Characteristic	Definition
Monthly variables	
Age	Age in years, defined at the start of each month
Age category	Dichotomous: 21–64, 65 and older
Gender	Dichotomous: female, male
Race	Categorical: White, Black, Hispanic (any race), other
Urban/rural residence	Categorical: mostly urban, mostly rural, completely rural[a]
Dual eligible status	Dichotomous: full dual eligible, Medicaid only[b]
Yearly variables	
Medicare managed care status	Dichotomous: enrolled in any Medicare Part C plan for at least one month of the year, enrolled in Medicare FFS for all months of the year
CCW indicators[c]	Dichotomous: beneficiary did or did not have condition in the 12 months before the start of the study year
Eligibility month	First month of the year for which the beneficiary met all eligibility criteria for the study
Prior study eligibility	Proportion of the prior 12 months for which the beneficiary met all study eligibility criteria
Prior Medicaid enrollment	Proportion of the prior 12 months for which the beneficiary was enrolled in Medicaid
Prior dual status	Proportion of the prior 12 months for which the beneficiary was dual eligible
Prior Medicare managed care experience	Enrollment in a Medicare managed care plan during the prior year

Note: The sample criteria included (1) being alive, (2) living in the target state, (3) being enrolled in Medicaid, (4) being eligible for full (non-restricted) Medicaid benefits, and (5) age 21 or older. Beneficiaries were not included in the analysis in months in which they did not meet all five of these sample criteria, so these characteristics were also defined at the monthly level to determine sample inclusion.

CCW = Chronic Conditions Data Warehouse; FFS = fee-for-service.

[a] We used county of residence and the urban/rural status based on the County Rural Lookup file from the Census Bureau to define the categories of urban/rural residence.

[b] Months in which a beneficiary was a partial dual eligible were not included in our analysis.

[c] The 50 CCW indicators included 24 chronic conditions and 26 potentially disabling conditions.

C. Study design

1.   Framework for choosing the study design

To understand the impacts of MLTSS programs on service use and quality of care, we would have liked to compare outcomes among MLTSS enrollees to the outcomes those enrollees would have experienced had they not participated in the program. However, because this scenario (known as the counterfactual) was impossible to observe, we set out to estimate counterfactual outcomes using a comparison group of FFS LTSS users who were as similar to those in the MLTSS program as possible. For each outcome, we planned to define the program impact to be the difference in expected outcomes between MLTSS and FFS, averaged over all MLTSS enrollees.

The variation in MLTSS program features and data availability across states prohibits the use of a single impact analysis that pools together MLTSS programs from multiple states. Specifically, each MLTSS program is implemented differently—for example, for different LTSS target populations—which could result in different program impacts on service use and quality of care. The LTSS environment also varies substantially across states. For instance, some states made significant progress in rebalancing their LTSS systems in the early 2000s, whereas other states have made progress in rebalancing in recent years. Moreover, data availability and quality preclude certain evaluation approaches in certain states. For these reasons, we conducted a separate evaluation of each MLTSS program that passed our data quality assessments. Separate evaluations for each program resulted in program-level estimates of the differences in service use and quality of care generated by distinct regression models and (when appropriate) matched comparison groups. Our framework for the design and comparison group selection is described in detail below.

a.   Overarching design: Difference-in-differences (DID) or repeated cross-sectional (RCS)

For each program, we intended to employ one of two overarching designs: either a DID design or an RCS design, both with a matched FFS comparison group (Wysocki et al. 2019). Because the DID design removes from the impact estimates unobserved differences between the populations receiving MLTSS and the comparison group before program implementation, we preferred the DID design but required sufficient data to observe impacts for the MLTSS and comparison groups both before and after the start of the program. Out of the five programs included in the evaluation, we had the option of using a DID design for Florida and Kansas because we were able to define a baseline period prior to the start of these programs. For the remaining three programs (New Mexico, New York, and Tennessee), we were unable to use a DID design because we did not have data from before the start of their MLTSS programs.

However, upon inspection of the data, we observed stark differences across all states in outcomes as measured in MAX/Alpha-MAX compared to TAF data systems (see Figures B.2–B.3 for illustration). This observation led to serious concerns about the validity of the core assumption of

DID analyses, known as parallel trends, even in Florida and Kansas.[43] Therefore, we ultimately used an RCS design for all states. Additionally, we decided it was inappropriate to evaluate both MAX/Alpha-MAX and TAF outcomes in the same analysis, because any differences we observed would be dominated by the effect from the data system used. For this reason, we limited our evaluation period in each state to periods in which TAF data were used for both the MLTSS state and its matched comparison state (when applicable).

Because we were unable to remove pre-existing differences between the MLTSS and FFS groups, we cannot assume that observed differences between the groups were due solely to the MLTSS program. Rather, we present the expected difference in the average outcomes for MLTSS enrollees had they lived in the comparison FFS state. These differences incorporate both the impact of the program and any secular differences between the states, such as differences in the LTSS environment or the way in which outcomes are reported. We provide more details on the RCS design, including regression model specifications, in Section C.5 of this appendix, below.

Figure B.2. Average monthly LTSS utilization for Florida and South Carolina,[a] 2012--2017
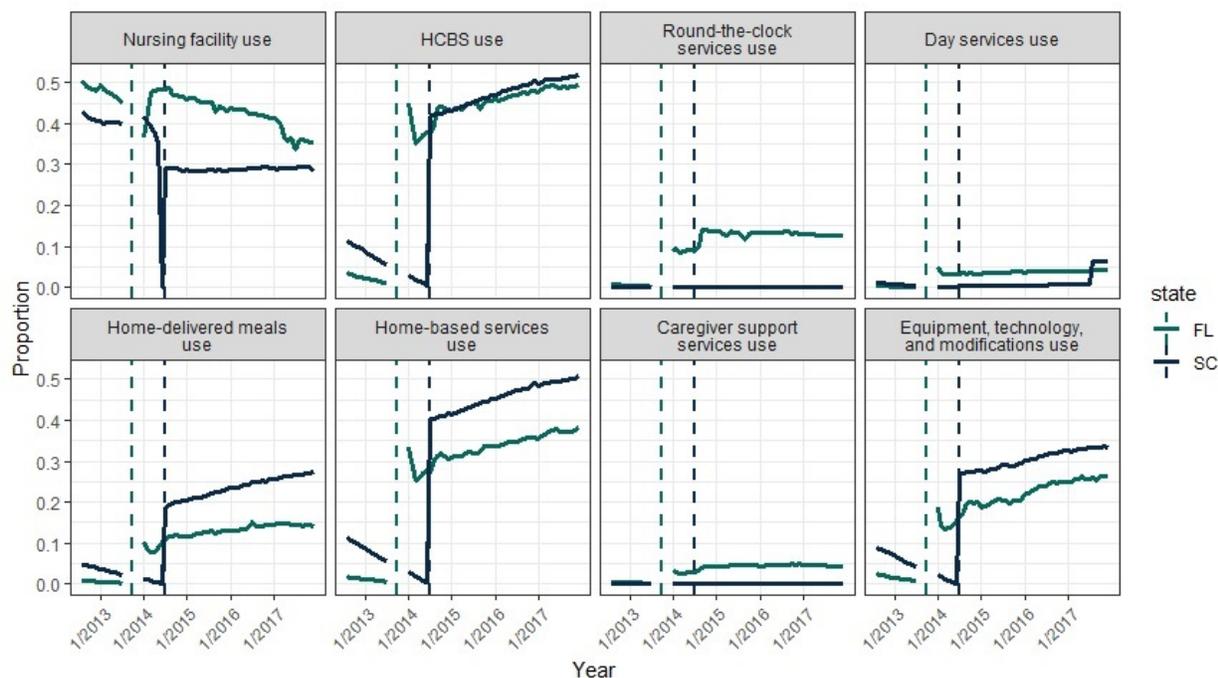
Note: Dashed vertical lines indicate the start date of TAF in each corresponding state. Florida was missing the last quarter of 2013 TAF, so this quarter was not evaluated.

FFS = fee-for-service; HCBS = home and community-based services; LTSS = long-term services and supports; MLTSS = managed long-term services and supports; TAF = T-MSIS Analytic File.

[a] South Carolina was chosen as the FFS comparison state for the evaluation of the Florida MLTSS program (see Section C.2 of this appendix, below).

[43] The parallel trends assumption in a DID analysis states that in the absence of the program, any observed differences in outcomes between MLTSS and FFS beneficiaries at baseline would have continued at the exact same magnitude into the intervention period, had the program not been implemented. Because the baseline period for Florida and Kansas came from MAX/Alpha-MAX data and much of the intervention period from TAF data, we did not find this assumption to be tenable.

Figure B.3. Average monthly LTSS utilization for Kansas and Oklahoma,[a] 2012–2017
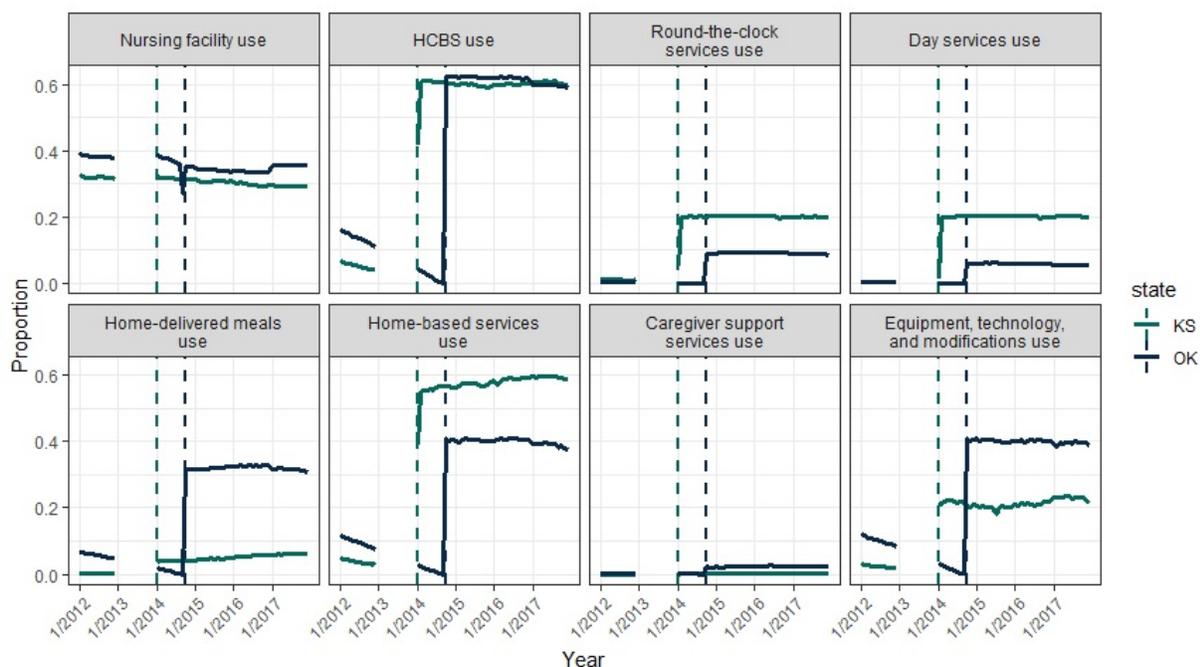
Note: Dashed vertical lines indicate the start date of TAF in each corresponding state. Kansas was missing 2013 TAF, so 2013 was not evaluated.

FFS = fee-for-service; HCBS = home and community-based services; LTSS = long-term services and supports; MLTSS = managed long-term services and supports; TAF = T-MSIS Analytic File.

[a] Oklahoma was chosen as the FFS comparison state for the evaluation of the Kansas MLTSS program (see Section C.2 of this appendix, below).

b.   Comparison group location: In state or out of state

Another key design consideration was whether the comparison group could be selected within the same state as the MLTSS program or needed to be selected from another state or states. The use of an in-state comparison group would eliminate a potential source of bias emerging from state-specific differences in LTSS implementation and the surrounding Medicaid environment. However, this option was available only if there were sufficient numbers of FFS LTSS beneficiaries in the state after the MLTSS program started, and if these beneficiaries were comparable to the MLTSS enrollees. In particular, an in-state comparison group would not be possible if the program was mandatory statewide for all LTSS-eligible beneficiaries. None of the five MLTSS programs in our evaluation had sufficient options for in-state FFS comparisons, so we considered out-of-state comparisons for each of the five programs. We describe our out-of-state comparison group selection below.

2.   Selecting comparison states

To identify out-of-state comparison groups, we compiled and compared information about the LTSS environments in the five MLTSS states to those in FFS states that had data that passed our quality checks; this process allowed us to select states with LTSS environments as similar as

possible to the MLTSS states on a number of relevant factors. Specifically, we selected FFS states to include for the respective comparison groups based on data availability; geographic proximity; demographic similarity; and comparable values for environmental measures of LTSS supply, demand, and Medicaid LTSS rebalancing indicators, measured as follows:

1. HCBS spending as a share of total LTSS spending for (1) all populations, (2) adults over age 65 and people with physical disabilities, and (3) people with developmental disabilities (based on data from CMS's LTSS Expenditure Reports)

2. Percentage of adults age 21 or older with an ADL-limiting disability and income at or below 250 percent of the federal poverty level receiving Medicaid or other government assistance health insurance (based on the AARP LTSS Scorecard, constructed with source data from the American Community Survey)

3. Number of home health/personal care aides per 100 people age 18 and older with an ADL-limiting disability (based on the AARP LTSS Scorecard, constructed with source data from the American Community Survey)

4. Number of nursing facility beds per 100 people age 18 and older with an ADL-limiting disability (constructed with source data from the American Community Survey and Area Health Resource File)

5. Percentage of dually eligible beneficiaries enrolled in Dual Special Needs Plans (based on Medicare Advantage/Part D Enrollment and Contract Data: Special Needs Plan Data)

We conducted a principal components analysis to identify the MLTSS and FFS states most similar to each other across these multiple LTSS environmental factors. After narrowing the states based on the principal components analysis, we also assessed geographic proximity and HCBS spending separately to finalize the comparison states for each MLTSS state. Based on our assessment, we selected South Carolina[45] as a comparison for Florida, Oklahoma as a comparison for Kansas, and Georgia as a comparison for Tennessee.

We had hoped to construct valid comparison groups for all MLTSS states, but data quality and program design among the pool of MLTSS and FFS states that passed our checks did not produce a suitable match for two states: New York and New Mexico. Specifically, we found that New York and New Mexico's administrative data quality was sufficient to evaluate the MAP program (New York) and the Centennial Care (MLTSS component) program (New Mexico), but we were unable to identify suitable FFS states with sufficient data quality across all years of the analysis to serve as comparisons for either of these programs. Rather than drop these two programs from the evaluation due to poor data quality among FFS states, we decided to keep them in the analysis using descriptive RCS regression models with no comparison group.

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[45] We originally selected Alabama, Georgia, and South Carolina as comparisons for Florida but ended up dropping Alabama due to data quality concerns and Georgia due to a large difference in the TAF periods that were available relative to Florida and South Carolina.

Table B.4 shows the final time periods and comparison states for each MLTSS program included in the evaluation. Due to the stark differences in outcomes between the MAX/Alpha-MAX and TAF data, we limited our evaluation period to months for which both the MLTSS and comparison state were using TAF data.

Table B.4. Evaluation design and time periods, by MLTSS program

MLTSS program	Program start	Design type	Comparison state(s)	Evaluation period
Florida Statewide Medicaid Managed Care Long-Term Care Program	August 1, 2013	Matched RCS	South Carolina	August 2014–December 2017[a]
Kansas KanCare (MLTSS component)	January 1, 2013	Matched RCS	Oklahoma	January 2015–December 2017[b]
New Mexico Centennial Care (MLTSS component)	August 1, 2008	Unmatched RCS	N/A	January 2014–December 2017[c]
New York MAP	October 1, 2007	Unmatched RCS	N/A	July 2015–December 2017[d]
Tennessee TennCare CHOICES in Long-Term Care	March 1, 2010	Matched RCS	Georgia	October 2015–December 2017[e]

MLTSS = managed long-term services and supports; RCS = repeated cross-sectional.

[a] South Carolina adopted TAF in September 2014. We began the evaluation one month later to correspond to the second year of the MLTSS program.

[b] Oklahoma adopted TAF in October 2014. We began the evaluation in January 2015 to correspond to the third year of the MLTSS program.

[c] New Mexico adopted TAF in January 2014.

[d] New York adopted TAF in July 2015.

[e] Tennessee and Georgia both adopted TAF in October 2015.

3. Sample identification for MLTSS programs and FFS comparisons

Although there were similarities in our approach to defining the samples across states, that approach was tailored to each state to account for nuances in program features.

a. Intervention period sample identification for Florida, Kansas, New Mexico, New York, and Tennessee samples

For the intervention period for each MLTSS program (Table B.4), we identified MLTSS enrollees with an institutional LOC. State-specific details are as follows:

- For Florida, we identified MLTSS enrollees from the Medicaid administrative data who were enrolled in the 1915(b)/(c) waiver that authorized the program. All beneficiaries in Florida's

MLTSS program are required to meet an institutional LOC, so we did not need to make any further limitations beyond age for our sample criteria.

- For Kansas, we identified MLTSS enrollees who were in the Kansas finder file who linked to the Medicaid administrative data. As noted above in Section B of this appendix, Kansas requires an institutional LOC for all enrollees, so no further limitation was needed.

- For New Mexico, we identified MLTSS enrollees who were in the New Mexico finder file who linked to the Medicaid administrative data, with at least one enrollment span that met the institutional LOC requirement.

- For New York, we identified MLTSS enrollees from the Medicaid administrative data who were enrolled in the managed care plans that provide services for the MLTC program; we confirmed our list of plans and relevant plan identifiers with staff from New York's Medicaid agency.

- For Tennessee, we identified MLTSS enrollees who were in the Tennessee finder file who linked to the Medicaid administrative data, with at least one enrollment span that met the institutional LOC requirement.

We used an ITT approach to identify the study sample. First, we identified the earliest month and year in which beneficiaries with an institutional LOC were enrolled in the MLTSS program. We then included beneficiaries for all subsequent months of the evaluation period in which they met all five monthly sample criteria, regardless of whether they were still enrolled in the relevant MLTSS program or met the institutional LOC for the program. The sample criteria included (1) being alive, (2) living in the target state, (3) being enrolled in Medicaid, (4) being eligible for full (non-restricted) Medicaid benefits, and (5) being age 21 or older.

a. FFS potential comparison sample identification for Florida, Kansas, and Tennessee evaluations

For the programs for which we were able to use a matched comparison group design (Florida, Kansas, and Tennessee), we identified potential comparison beneficiaries in each FFS comparison state based on (1) enrollment in a 1915(c) waiver for a similar target population as covered by the respective MLTSS program or (2) nursing facility use.

We used waiver ID and type codes for relevant waivers to identify the 1915(c) waiver enrollees in each state. Relevant waivers for the FFS comparison states are listed in Table B.5; we included them during relevant periods in which they were active in each state.

The approach for nursing facility users differed based on dual eligibility status. All full benefit dually eligible beneficiaries with a non-crossover claim from a nursing facility were included in

the sample. Among non-dual beneficiaries, individuals who had nursing facility use and met aged or blind/disabled eligibility in the month of service also were included in the sample.[45]

We determined whether beneficiaries met the 1915(c) waiver criteria, nursing facility criteria, or both during our analysis period, and set the first month for sample inclusion based on the first observed criteria (based on service begin dates). For example, if a beneficiary from Oklahoma (comparison state for Kansas) was identified based on relevant 1915(c) waiver criteria in February 2015 and met the nursing facility criteria in April 2015, we set the first month for sample inclusion as February 2015. After this identification, we used an ITT approach for the potential comparison sample, similar to that used for the MLTSS enrollees. That is, after the first month of sample inclusion, beneficiaries remained in the potential comparison sample for all subsequent months in which they met the same five monthly sample criteria MLTSS enrollees were required to meet.[46]

Table B.5. 1915(c) waivers for sample identification for FFS comparison states

1915(c) waiver name, by state		
Georgia	**Oklahoma**	**South Carolina**
• Elderly & Disabled Waiver • Independent Care Waiver • New Options Waiver	• OK Advantage Waiver • OK Community Waiver • OK In-Home Supports – Adult Waiver	• Community Choices Waiver • Community Supports Waiver • Head and Spinal Cord Injury Waiver • HIV/AIDS Waiver • Mechanical Ventilator Dependent Waiver

FFS = fee-for-service; HIV/AIDS = human immunodeficiency virus/ acquired immunodeficiency syndrome.

4.   Comparison beneficiary selection and weighting

a.   Propensity score approach

As mentioned in Section III.C.2.c, we used propensity score matching to select comparison beneficiaries for Kansas and Tennessee, and propensity score weighting to select comparison beneficiaries for Florida. Propensity score weighting was used for Florida because matching approaches perform best in situations in which the pool of potential comparison individuals is

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[45] Ideally, we wanted to include only custodial nursing facility users, but because we were unable to distinguish post-acute nursing facility use from custodial nursing facility use in the data, we applied an additional restriction for non-dual beneficiaries. The restriction was based on categorical Medicaid eligibility and intended to restrict the sample to the most relevant group for the analysis so we would not include generally healthy adults in the sample who used short-term nursing facility services only for post-acute rehabilitation. Because we focused on non-crossover Medicaid claims for dual eligible beneficiaries, we expected to pick up custodial (not post-acute) nursing facility users among these beneficiaries.

[46] Comparison beneficiaries were ultimately included in the final analysis only in months in which they were matched.

comparable in size or larger than the number of treated beneficiaries, which was not the case for South Carolina in comparison to Florida.[47] In such cases, propensity score weighting can provide better balance than matching.

Regardless of whether matching or weighting was used, we estimated propensity scores in each state using logistic regression models. To ensure good balance across time and within certain strata, we fit separate propensity score models for each combination of (1) age category (whether the beneficiary was at least 65 years old), (2) dual status (among those under 65, only because there were insufficient numbers to match among the Medicaid-only category for those age 65 and older), and (3) year. We included all variables described in Table B.3 in the propensity score models unless the variable had to be dropped due to either low prevalence or collinearity with other variables. We defined monthly matching characteristics as their values on the first month of the year for which the beneficiary met all study eligibility criteria. Obtaining appropriate balance on the CCW indicators posed a particular challenge due to the large number of these indicators and the fact that most were relatively rare. Including each of the indicators in the propensity score model as a separate covariate could detract from the balance on other covariates we considered to be more important. Instead, we performed a principal components decomposition of the CCW indicators (Landgraf and Lee 2015), which identifies 10 continuous covariates that best explain the variation in the 50 CCW indicators across beneficiaries in our sample. We then included the principal component scores as covariates in our propensity score model.

Once we fit the propensity score models, we determined the final weights for comparison beneficiaries either through matching (Kansas, Tennessee) or inverse probability of treatment weighting (Florida). When we used propensity score matching, we conducted variable-ratio matching that allows comparison-to-treated ratios that range from 1:10 to 10:1 within matched sets. This approach works well in cases in which the treatment and comparison groups are comparable in size. We exact-matched on the stratification variables described above (age category, dual status among those under 65 only as described above, and year), and included a caliper on eligibility month to ensure that matched comparison beneficiaries became eligible around the same time of the year as MLTSS beneficiaries. In Florida when we used inverse probability of treatment weighting, we defined the inverse probability weight as $\dfrac{p_{it}}{1-p_{it}}$, where p_{it} is the propensity score for beneficiary i during year t. We normalized these weights within the strata defined by age category, dual status, and year), which similarly ensures balance on the stratification variables. We then winsorized the weights and renormalized them iteratively until

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[47] As noted in Section C.2 of this appendix, we originally selected Alabama, Georgia, and South Carolina as comparisons for Florida but ended up dropping Alabama due to data quality concerns and Georgia due to a large difference in the TAF periods available relative to Florida and South Carolina. Therefore, the potential comparison pool for Florida was smaller than the number of treated beneficiaries.

the minimum weight was .01 and the maximum weight was 20, to ensure that no beneficiary received too large (or small) a weight.

b.   Balance between MLTSS and comparison groups before and after matching or weighting

To assess the balance between the MLTSS beneficiaries and the weighted or matched comparison group, we calculated standardized differences[48] for each relevant variable for each pair of states. Relevant variables include (1) all variables included in the propensity score model (including the principal components of the CCW indicators) and (2) the 50 individual CCW indicators. We calculated each standardized difference separately by dual status and study year. Following the recommendations of Rubin (2001) and Stuart (2010), we aimed to reduce standardized differences to under 0.25.

Figures B.4–B.6 show the standardized differences for the variables included in the propensity score models, both before and after matching or weighting.[49] Based on our criteria, the weighted comparison groups appear remarkably similar to the corresponding MLTSS enrollees on nearly all observed covariates for each pair of states. Among the 1,509 standardized differences we calculated, only 13 (<1%) showed post-matching standardized differences above 0.25. Among these 13, 7 corresponded to CCW indicators comparing Kansas to Oklahoma, where one of the two states had a very small proportion of beneficiaries observed with the particular condition, thus making them quite difficult to balance; 3 just barely exceeded the 0.25 threshold (and did not exceed 0.26), and 3 corresponded to prior measures of eligibility in the 12 months that preceded each observation.

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[48] The standardized difference is defined as the difference in the mean variable between the MLTSS and FFS groups, divided by the standard deviation of the variable in the MLTSS group.

[49] We do not display the balance for each of the 50 individual CCW indicators for reasons of conciseness, but we note that most of these indicators showed very strong balance. We do include the balance of these variables in the statistics regarding the 1,509 standardized differences.

Figure B.4. Covariate balance between Florida and South Carolina, both before and after propensity score weighting, by dual status and study year
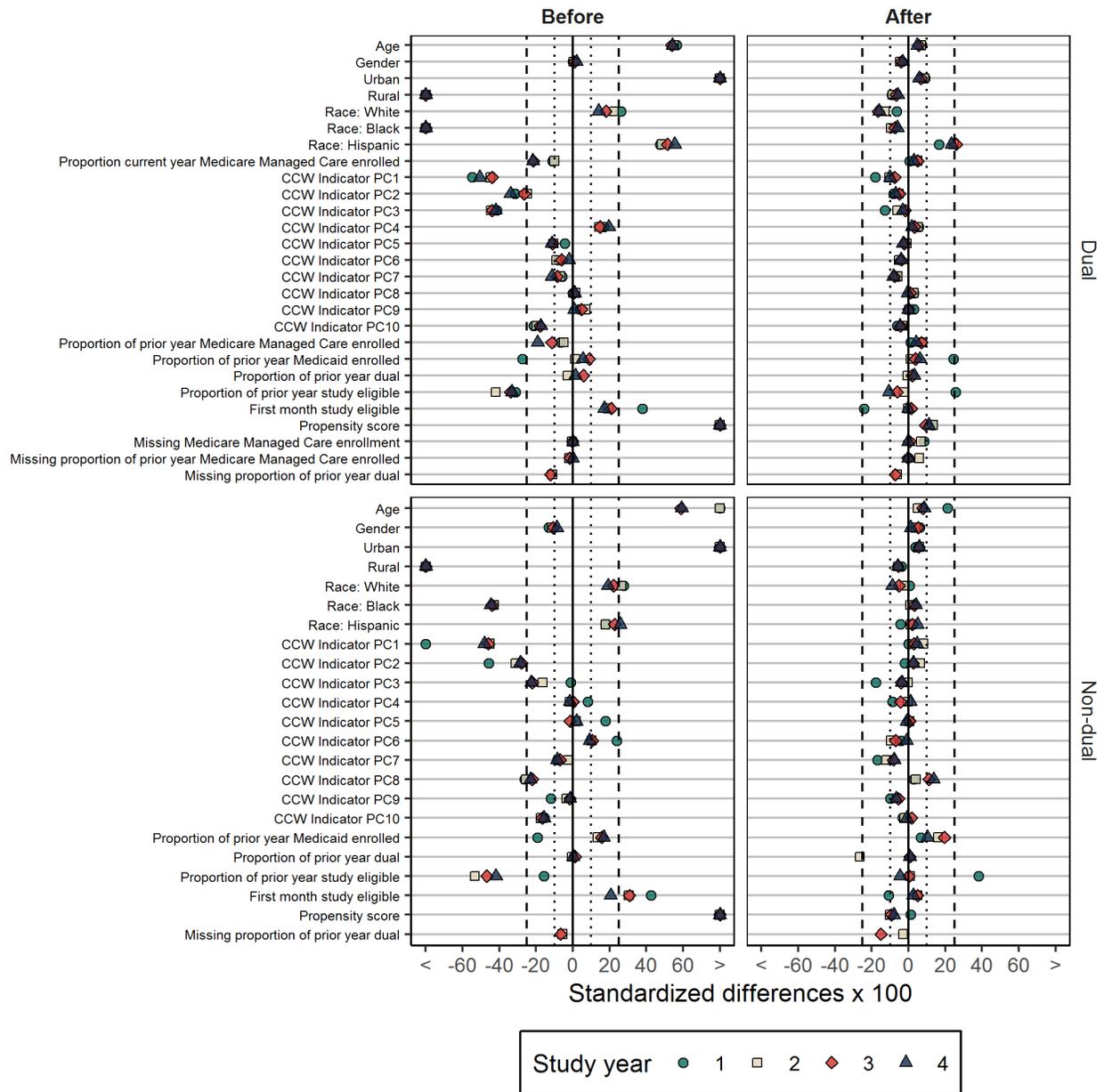
CCW = Chronic Conditions Data Warehouse; PC = principal component.

Year 1 corresponds to October 2014 through September 2015, Year 2 to October 2015 through September 2016, Year 3 to October 2016 through September 2017, and Year 4 to October 2017 through December 2017.

Figure B.5. Covariate balance between Kansas and Oklahoma, both before and after matching, by dual status and study year
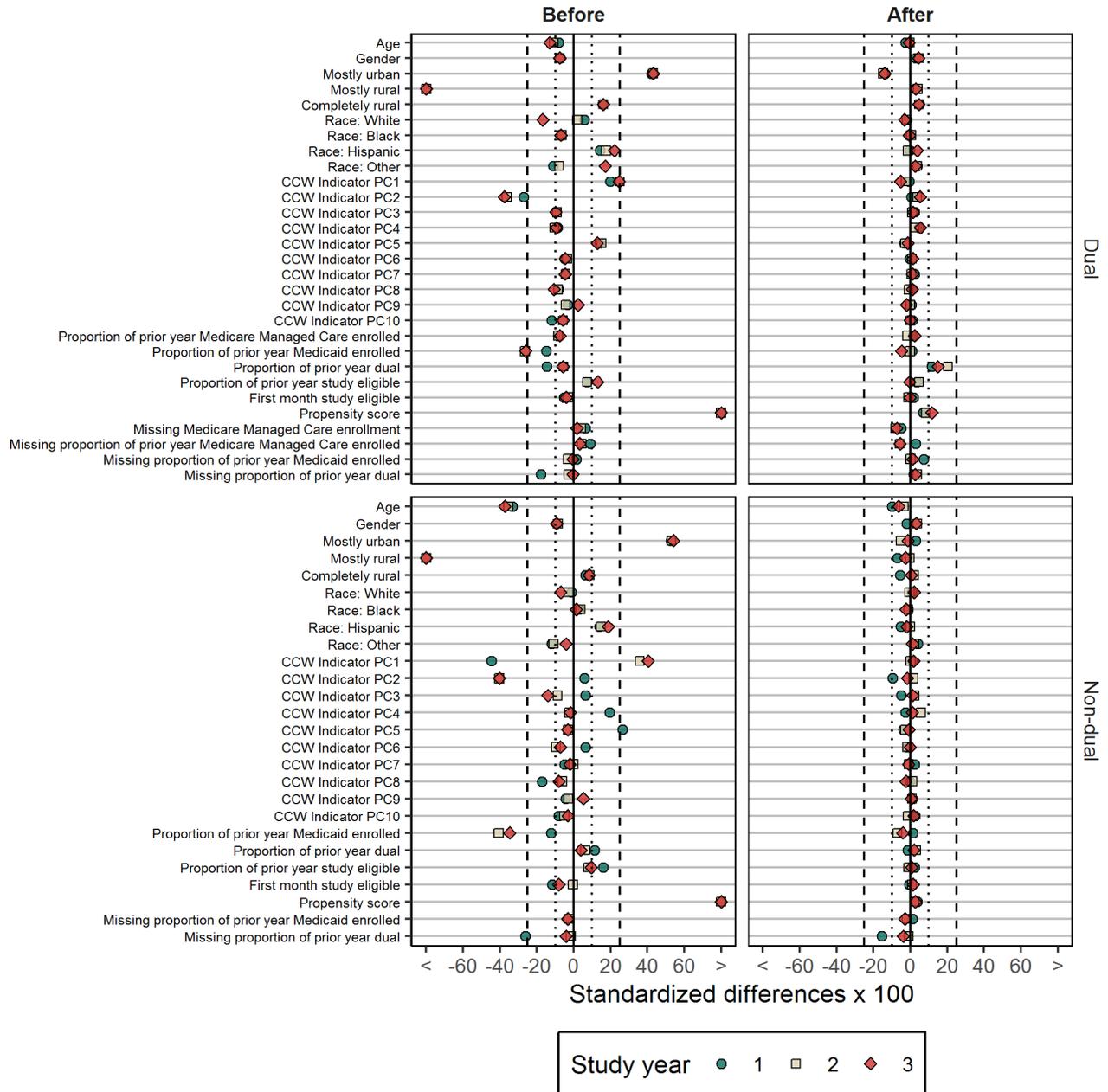
Standardized differences x 100

CCW = Chronic Conditions Data Warehouse; PC = principal component.

Year 1 corresponds to January 2015 to December 2015, Year 2 to January 2016 to December 2016, and Year 3 to January 2017 to December 2017.

Figure B.6. Covariate balance between Tennessee and Georgia, both before and after matching, by dual status and study year
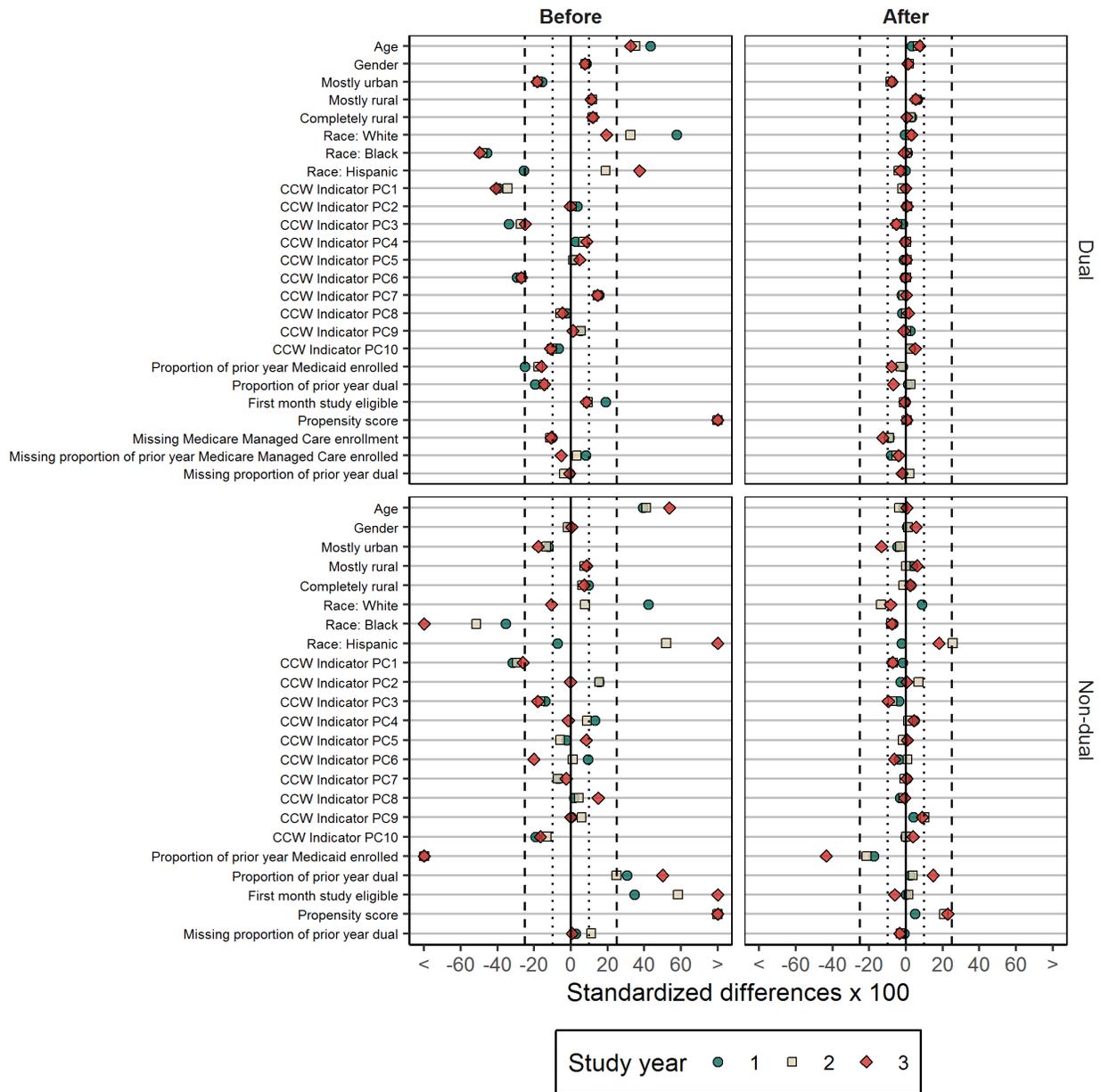
CCW = Chronic Conditions Data Warehouse; PC = principal component.

Year 1 corresponds to October 2015 to December 2015, Year 2 to January 2016 to December 2016, and Year 3 to January 2017 to December 2017.

5.   Program-level regression approach

For each MLTSS state, we fit a separate regression model for each of the 10 outcomes of service use and quality of care (see Table B.2) other than New York, in which only the 8 outcomes regarding LTSS utilization applied. These models fall into two types, depending on the outcome. For the eight indicators of LTSS service utilization and the indicator of potentially avoidable hospitalizations, we fit logistic regression models at the monthly level. For the one count-valued outcome (inpatient hospital days), we fit a linear regression model at the annual level. We describe these models in more detail below.

a.   LTSS service utilization and potentially avoidable hospitalizations

The eight indicators of LTSS service utilization and the one measure of quality of care (potentially avoidable hospitalizations) were defined as dichotomous outcomes at the monthly level. For these outcomes, we fit logistic regression models at the monthly level.[50] For states with a matched comparison group (Florida, Kansas, and Tennessee), we allowed the effect of being in an MLTSS state to vary by both year and dual status (when appropriate), but we assume that these effects are constant within each year. For New Mexico and New York, on the other hand, we did not estimate an MLTSS effect because all beneficiaries are MLTSS enrollees but we did allow the mean outcomes to vary by program year and, when appropriate, dual status. All models were adjusted for the same covariates included in the propensity score models (Table B.3).

More specifically, let i index the beneficiary, j index time in months, and $t[j]$ be the year that corresponds to month j. For the three states with a matched comparison group, we modeled the eight LTSS utilization measures as follows:

$$\log\left(\frac{p_{ij}}{1-p_{ij}}\right) = \alpha + \beta X_{ij} + \delta_{t[j]} + \theta_{t[j]}MLTSS_i + \phi_{t[j]}MLTSS_i \times dual_{ij}$$

In this model, p_{ij} is the probability that beneficiary i utilizes the particular LTSS service during month j, $MLTSS_i$ is the indicator that this beneficiary is from an MLTSS state, $dual_{ij}$ is the indicator that the beneficiary has full dual status during month j, and X_{ij} are beneficiary-specific covariates during month j. The key parameters of interest are θ_t, which represents the log odds ratio of the MLTSS indicator comparing MLTSS to FFS beneficiaries during year t, and ϕ_t, which represents the additional change in the log odds ratio of the MLTSS indicator for

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[50] Although we defined potentially avoidable hospitalizations to be dichotomous at the monthly level and analyzed that measure using logistic regression, because the outcome is rare, we did not display results as monthly probabilities. Rather, we multiplied the probabilities by 1,000 to present them as the expected number of potentially avoidable hospitalizations per 1,000 beneficiary- months.

dual beneficiaries compared to Medicaid-only during year t. The other parameters account for an overall intercept (α), covariates for risk-adjustment (β), and a secular time trend (δ_t).

We weighted each comparison observation according to either the matching weight (for Kansas and Tennessee) or the propensity score weight (for Florida), so that the weighted comparison sample appeared more similar to the MLTSS sample on observed covariates. We also accounted for within-subject correlation in all models by estimating cluster-robust standard errors.

For the quality of care outcome (potentially avoidable hospitalizations), the model is similar but does not include terms for dual status, because these outcomes are only defined for Medicaid-only beneficiaries. The corresponding models in New Mexico and New York differ from those in Florida, Kansas, and Tennessee in that they do not include effects for MLTSS (because all beneficiaries in these models are from an MLTSS program). In addition, none of the models for New York include terms for dual status because this program enrolls only dually eligible beneficiaries.

b.   Inpatient hospital days

The inpatient hospital days outcome is the only outcome that is not dichotomous; rather, it is a count outcome that can take values from 0 to 31 days per month. Our original plan was to model this outcome at the monthly level, but upon inspecting the distribution of the data, we found that the monthly outcome had a non-standard distribution that included a long right tail but a spike at 28, 30, or 31 days (depending on the month). To standardize the distribution, we aggregated the data to the annual level. We defined the outcome to be the annualized number of inpatient hospital days by summing the total number of inpatient days for each beneficiary, dividing by the number of months observed, and multiplying by 12. This approach is standard for estimating outcomes at the annual level when beneficiaries are observed for partial years. We defined the covariates for each beneficiary year according to their values on the first month that the beneficiary met the study eligibility criteria for that year.

We fit a linear regression model to the annual data, with a form very similar to the logistic regression models fit to the dichotomous outcomes. Using the same notation as before, with Y_{it} representing the annualized number of inpatient hospital days for beneficiary i during year t, we fit the following model in Florida, Kansas, and Tennessee:

$$Y_{it} = \alpha + \beta X_{it} + \delta_t + \theta_t MLTSS_i + \epsilon_{it}$$

This model allows the effect of being in an MLTSS state to vary by program year. Note that we did not include dual status in the model, because the outcome was defined only for non-duals. The model for New Mexico is similar, except that there are no MLTSS terms because all beneficiaries are in an MLTSS program. We did not fit this model in New York because that state's MLTSS program only enrolls dually eligible beneficiaries.

The model is fit as a weighted regression, where the weight has two components multiplied together. The first component is either the matching weight (for Florida) or propensity score weight (for Kansas and Tennessee), which applies only to individuals from the matched comparison group (MLTSS beneficiaries receive a weight of one). The second component of the total weight is known as an eligibility weight, which is defined as the proportion of the full year for which the beneficiary was observed (that is, beneficiaries observed for nine months will receive an eligibility weight of 0.75). This weight accounts for the fact that observations taken over a smaller time period are inherently noisier than those taken over a longer time period and should be down-weighted accordingly. We accounted for within-beneficiary correlation by calculating cluster-robust standard errors.

D. Sample characteristics

In this section, we include tables of the sample characteristics for the analytic samples for each of the five MLTSS states, including the FFS comparison states when applicable (Tables B.6 to B.10).

Table B.6. Sample characteristics for Florida and South Carolina

Characteristic	Year 1 (Oct 2014–Sept 2015)		Year 2 (Oct 2015–Sept 2016)		Year 3 (Oct 2016–Sept 2017)		Year 4 (Oct 2017–Dec 2017)	
	FL	SC	FL	SC	FL	SC	FL	SC
Number of unique beneficiaries	99,053	40,015	114,519	42,378	122,018	42,565	110,278	38,452
Age (mean)	77.7	76.2	77.3	76.3	76.9	76.3	77.0	76.4
Mean age above 65	82.1	80.8	82.0	80.8	81.8	81.0	81.9	81.1
Age category (%)								
Age 21–64	16.0	17.0	16.9	16.9	17.7	17.7	17.5	17.6
Age 65 or older	84.0	83.0	83.1	83.1	82.3	82.3	82.5	82.4
Race (%)								
White	55.7	56.3	53.8	60.0	51.9	59.7	49.3	57.3
Black	16.7	20.2	16.5	20.1	16.4	18.6	16.1	18.1
Hispanic	27.6	23.5	29.7	19.9	31.7	21.8	34.6	24.6
Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gender (%)								
Female	69.3	70.4	68.4	70.1	67.7	69.3	67.5	68.8
Male	30.7	29.6	31.6	29.9	32.3	30.7	32.5	31.2
Residential area (%)[a]								
Rural	4.9	7.3	4.8	7.3	4.6	6.4	4.5	6.1
Urban	95.1	92.7	95.2	92.7	95.4	93.6	95.5	93.9
Dual status (%)								
Non-dual	5.4	5.2	5.8	5.8	6.2	5.9	6.3	6.0
Full dual eligible	94.6	94.8	94.2	94.2	93.8	94.1	93.7	94.0

Table B.6 *(continued)*

Characteristic	Year 1 (Oct 2014–Sept 2015)		Year 2 (Oct 2015–Sept 2016)		Year 3 (Oct 2016–Sept 2017)		Year 4 (Oct 2017–Dec 2017)	
	FL	SC	FL	SC	FL	SC	FL	SC
Top five CCW indicators (%)								
Hypertension[b]	75.1	74.1	72.8	74.1	71.6	74.3	72.7	74.8
Alzheimer's disease or senile dementia[b]	58.6	49.3	60.6	54.4	62.1	57.3	63.1	57.4
Anemia[b]	57.1	50.6	53.2	50.1	52.5	50.4	55.7	52.3
Depression[b]	48.5	40.7	47.4	43.8	46.8	45.3	47.7	44.6
Hyperlipidemia[b]	47.1	44.8	46.6	42.6	45.9	41.5	47.6	43.3
Average proportion of prior year Medicaid enrolled	92.2	90.7	94.0	93.7	95.1	94.4	97.0	96.2
Average proportion of prior year study eligible	58.8	47.2	71.1	72.4	74.7	77.3	80.9	84.6
Prior year dual status[b]	85.1	82.9	87.4	87.5	88.0	87.9	89.7	89.4
Average proportion of prior year Medicare Managed Care enrollment[b]	21.2	22.2	24.8	22.2	27.2	24.5	28.4	27.0
Medicare Managed Care enrollment[b]	20.2	21.4	23.4	21.4	25.5	23.3	27.2	26.2

Note: This table displays sample characteristics for each year for enrollees in the Florida Statewide Medicaid Managed Care Long-Term Care Program and matched comparison beneficiaries from South Carolina.

CCW = Chronic Conditions Data Warehouse.

[a] Beneficiaries' residential area is categorized as either rural or urban. The rural category includes beneficiaries living in counties that were mostly rural and completely rural because there were too few beneficiaries in the individual categories to keep them as separate categories in our analysis.

[b] Proportion indicated for these characteristics is the proportion of all beneficiaries for whom this characteristic was reported. We do not exclude missing values for this calculation.

Table B.7. Sample characteristics for Kansas and Oklahoma

Characteristic	Year 1 (Jan 2015–Dec 2015)		Year 2 (Jan 2016–Dec 2016)		Year 3 (Jan 2017–Dec 2017)	
	KS	OK	KS	OK	KS	OK
Number of unique beneficiaries	34,431	40,919	34,423	42,104	34,915	41,765
Age (mean)	63.4	64.0	62.8	62.7	62.4	62.6
Mean age above 65	80.5	80.6	80.3	80.1	80.1	80.2
Age category (%)						
Age 21–64	48.4	48.1	49.9	49.9	50.8	50.5
Age 65 or older	51.6	51.9	50.1	50.1	49.2	49.5
Race (%)						
White	79.7	79.5	78.2	78.1	73.5	71.5
Black	10.8	11.2	11.1	11.2	11.0	11.2
Hispanic	4.6	5.0	5.1	5.7	6.1	6.1
Other	4.9	4.2	5.6	4.9	9.4	11.2
Gender						
Female	61.7	61.1	61.3	59.2	60.9	59.1
Male	38.3	38.9	38.7	40.8	39.1	40.9
Residential area (%)						
Completely rural	6.0	4.8	5.8	4.9	5.7	4.8
Mostly rural	14.5	14.2	14.3	13.1	14.0	13.5
Mostly urban	76.0	80.8	76.3	81.9	76.7	81.6
Dual status (%)						
Non-dual	17.3	16.7	18.3	18.1	19.7	19.4
Full dual	82.7	83.3	81.7	81.9	80.3	80.6
Top five CCW indicators (%)						
Hypertension[a]	55.6	56.7	55.6	56.8	53.9	55.1
Depression[a]	39.0	38.7	42.7	43.4	41.7	41.1
Major depressive affective[a]	35.9	37.0	37.9	38.0	36.9	36.2
Diabetes[a]	33.0	31.8	33.0	32.2	32.7	32.0
Hyperlipidemia[a]	32.8	34.2	33.6	31.6	32.6	29.6
Average proportion of prior year Medicaid enrolled[a]	83.6	83.7	84.3	85.3	84.9	86.9
Average proportion of prior year study eligible[a]	82.4	81.7	83.2	82.5	83.6	84.1
Prior year dual status[a]	72.7	71.7	72.4	69.2	71.3	69.8
Average proportion of prior year Medicare Managed Care enrollment[a]	6.5	6.4	6.9	7.5	7.7	7.1
Medicare Managed Care enrollment[a]	6.6	6.4	7.2	7.8	9.5	8.3

Note: This table displays sample characteristics for each year for enrollees in the Kansas KanCare (MLTSS component) program and comparison beneficiaries from Oklahoma.

CCW = Chronic Conditions Data Warehouse.

[a] Proportion indicated for these characteristics is the proportion of all beneficiaries for whom this characteristic was reported. We do not exclude missing values for this calculation.

Table B.8. Sample characteristics for Tennessee and Georgia

Characteristic	Year 1 (Oct 2015–Dec 2015)		Year 2 (Jan 2016–Dec 2016)		Year 3 Jan 2017–Dec 2017)	
	TN	GA	TN	GA	TN	GA
Number of unique beneficiaries	7,852	67,437	35,619	79,064	36,556	80,231
Age (mean)	73.2	73.7	73.1	72.2	72.6	71.5
Mean age above 65	80.8	80.8	80.8	79.6	80.7	79.1
Age category (%)						
Age 21–64	26.3	24.6	26.5	26.2	27.7	27.6
Age 65 or older	73.7	75.4	73.5	73.8	72.3	72.4
Race (%)						
White	74.3	74.9	65.7	61.7	56.8	54.0
Black	21.7	21.2	20.0	20.0	18.7	19.6
Hispanic	4.0	3.9	14.3	18.3	24.4	26.4
Other	0.0	0.0	0.0	0.0	0.0	0.0
Gender						
Female	68.5	68.2	67.7	66.9	66.9	66.1
Male	31.5	31.8	32.3	33.1	33.1	33.9
Residential area (%)						
Completely rural	6.2	5.5	6.2	5.4	6.2	5.8
Mostly rural	33.6	30.8	33.2	30.6	32.3	29.9
Mostly urban	60.2	63.8	60.0	63.9	60.3	64.2
Dual status (%)						
Non-dual	11.9	11.2	12.4	12.3	14.6	14.4
Full dual	88.1	88.8	87.6	87.7	85.4	85.6
Top five CCW indicators (%)						
Hypertension[a]	62.8	65.2	61.4	61.3	72.3	73.4
Alzheimer's disease or senile dementia[a]	53.2	54.0	53.2	49.3	57.6	52.4
Major depressive affective[a]	39.0	41.6	39.8	40.6	43.2	45.1
Depression[a]	38.4	38.9	40.4	38.5	45.6	43.9
Anemia[a]	38.2	37.4	37.9	35.2	42.5	41.2
Average proportion of prior year Medicaid enrolled	87.9	89.0	88.9	90.2	90.0	92.3
Average proportion of prior year study eligible	77.9	77.9	80.2	81.5	81.5	82.9
Prior year dual status[a]	78.0	78.5	78.1	78.1	77.6	78.8
Average proportion of prior year Medicare Managed Care enrollment[a]	18.9	18.3	21.2	22.1	23.3	23.1
Medicare Managed Care enrollment[a]	20.9	20.4	21.8	22.4	24.0	23.2

Note: This table displays sample characteristics for each year for enrollees in the Tennessee TennCare CHOICES in Long-Term Care program and comparison beneficiaries from Georgia.

CCW = Chronic Conditions Data Warehouse.

[a] Proportion indicated for these characteristics is the proportion of all beneficiaries for whom this characteristic was reported. We do not exclude missing values for this calculation.

Table B.9. Sample characteristics for New Mexico

Characteristic	Year 1 (Jan 2014–Dec 2014)	Year 2 (Jan 2015–Dec 2015)	Year 3 (Jan 2016–Dec 2016)	Year 4 (Jan 2017–Dec 2017)
Number of unique beneficiaries	28,599	31,568	33,173	34,345
Age (mean)	63.6	62.5	62.1	61.9
Mean age above 65	78.7	78.4	78.2	78.0
Age category (%)				
Age 21–64	50.7	53.3	54.5	54.9
Age 65 or older	49.3	46.7	45.5	45.1
Race (%)				
White	42.1	42.7	43.1	43.4
Black	2.5	2.6	2.6	2.6
Hispanic	34.6	34.4	34.4	34.3
Other	20.8	20.3	20.0	19.7
Gender (%)				
Female	63.6	63.1	62.7	62.5
Male	36.4	36.9	37.3	37.5
Residential area (%)				
Completely rural	1.6	1.6	1.5	1.5
Mostly rural	12.9	12.6	12.4	12.2
Mostly urban	85.5	85.8	86.1	86.4
Dual Status (%)				
Non-dual	31.1	33.6	34.0	34.1
Full dual	68.9	66.4	66.0	65.9
Top five CCW indicators (%)				
Depression	19.9	30.7	32.2	32.5
Diabetes	26.8	36.4	35.7	35.6
Hyperlipidemia	21.2	25.1	24.3	23.8
Hypertension	36.7	47.4	46.8	47.1
Rheumatoid arthritis	23.1	30.6	29.8	29.9
Prior year dual status	64.0	61.8	61.6	61.5
Average proportion of prior year Medicare/Medicaid enrollment	93.3	36.5	33.3	33.9
Medicare Managed Care enrollment	28.9	30.6	33.8	38.7
Average proportion of prior year Medicaid enrolled	74.0	73.7	80.0	83.0
Average proportion of prior year study eligible	73.3	71.9	76.8	79.1

Note: This table displays sample characteristics for each year for enrollees in the New Mexico Centennial Care
(MLTSS component) program.

CCW = Chronic Conditions Data Warehouse.

Table B.10. Sample characteristics for New York MAP

Characteristic	Year 1 July 2015 – Dec 2015)	Year 2 (Jan 2016 – Dec 2016)	Year 3 (Jan 2017 – Dec 2017)
Number of unique beneficiaries	8,039	9,614	12,732
Age (mean)	76.2	76.4	76.7
Mean age above 65	79.3	79.5	79.6
Age category (%)			
Age 21–64	12.8	12.7	12.1
Age 65 or older	87.2	87.3	87.9
Race (%)			
White	14.6	13.4	10.9
Black	26.0	25.7	24.9
Hispanic	49.4	51.0	53.3
Other	10.0	9.9	11.0
Gender (%)			
Female	75.6	75.5	75.1
Male	24.4	24.5	24.9
Top five CCW indicators (%)			
Diabetes	28.1	48.6	49.8
Hyperlipidemia	20.7	33.3	36.5
Hypertension	33.9	65.0	69.7
Ischemic heart disease	20.9	28.5	31.1
Rheumatoid arthritis	13.7	35.7	38.1
Medicare Managed Care enrollment	95.6	94.3	95.5
Average proportion of prior year Medicare Managed Care enrollment	95.0	94.9	95.6
Average proportion of prior year Medicaid enrolled	99.6	99.8	99.7
Average proportion of prior year study eligible	89.4	90.0	81.4

Note: This table displays sample characteristics for each year for enrollees in the New York Medicaid Advantage Plus (MAP) program.

CCW = Chronic Conditions Data Warehouse.

E. Additional findings on utilization of specific HCBS outcomes

1. Regression-adjusted utilization over time across MLTSS programs for specific HCBS

In this section, we present regression-adjusted mean outcomes for specific HCBS for all five MLTSS programs by year (Figure B.7).

Figure B.7. Regression-adjusted utilization across MLTSS programs for specific HCBS
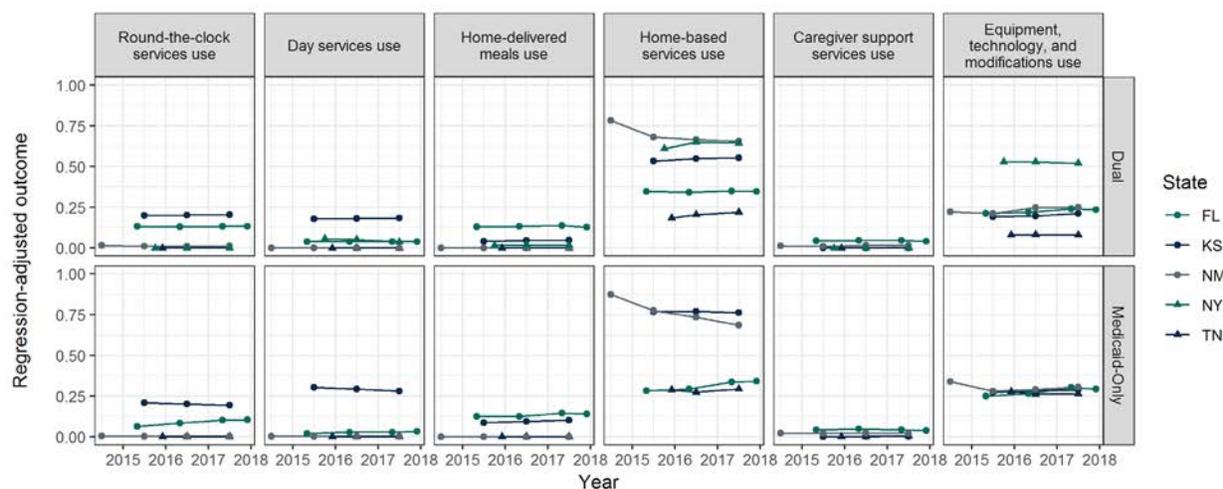
Note: These plots include monthly regression-adjusted service utilization, expressed as a percentages per month, for specific HCBS outcomes. Programs in the evaluation included Florida Statewide Medicaid Managed Care Long-Term Care Program, Kansas KanCare (MLTSS component), New Mexico Centennial Care (MLTSS component), New York Medicaid Advantage Plus (MAP), and Tennessee TennCare CHOICES in Long-Term Care. See the footnotes in tables B.11 and B.12 for service exclusions in New Mexico and New York.

FL = Florida; HCBS = home and community-based services; KS = Kansas; MLTSS = managed long-term services and supports; NM = New Mexico; NY = New York; TN = Tennessee.

2. Regression-adjusted service utilization over time for specific HCBS for unmatched MLTSS programs

In this section, we include regression-adjusted mean outcomes for specific HCBS for New Mexico Centennial Care (MLTSS Component) (Table B.11) and New York MAP (Table B.12). Among dual eligible enrollees in New Mexico, use was generally low for most services aside from home-based services and equipment, technology, and modifications. Use of home-based services declined over the analysis period, but use of equipment, technology, and modifications increased. Use was also low among Medicaid-only beneficiaries for other HCBS aside from home-based services and equipment, technology, and modifications. Like patterns of use among dual eligible enrollees, use of home-based services decline over the analysis period, but unlike pattern of use among dual eligible enrollees, use of equipment, technology, and modifications declined.

Among New York MAP enrollees, use was highest for home-based services and equipment, technology, and modifications. Use of home-based services increased over the analysis period, but use of equipment, technology, and modifications remained steady. Use of other specific HCBS was generally low, and day services use declined in the last year of the analysis period.

Table B.11. Regression-adjusted utilization for New Mexico Centennial Care (MLTSS component) for specific HCBS

Outcome	Population	Year 1 (Jan 2014–Dec 2014) Mean (SE)	Year 2 (Jan 2015–Dec 2015) Mean (SE)	Year 3 (Jan 2016–Dec 2016) Mean (SE)	Year 4 (Jan 2017–Dec 2017) Mean (SE)
Round-the-clock services use	Dual eligibles	1.5 (0.1)	1.2 (0.1)	1.2 (0.1)	1.3 (0.1)
	Medicaid-only	0.5 (0.1)	0.4 (0.1)	0.4 (0.1)	0.4 (0.1)
Day services use	Dual eligibles	0.1 (0.0)	0.2 (0.0)	0.2 (0.0)	0.2 (0.0)
	Medicaid-only	0.2 (0.0)	0.2 (0.0)	0.2 (0.0)	0.2 (0.0)
Home-delivered meals use[a]	Dual eligibles	0.1 (0.0)	0.1 (0.0)	0.1 (0.0)	0.1 (0.0)
	Medicaid-only	0.1 (0.0)	0.1 (0.0)	0.1 (0.0)	0.1 (0.0)
Home-based services use	Dual eligibles	78.2 (0.3)	68.2 (0.3)	66.6 (0.3)	65.6 (0.3)
	Medicaid-only	87.5 (0.3)	77.4 (0.4)	73.3 (0.4)	68.6 (0.4)
Caregiver support services use	Dual eligibles	1.4 (0.0)	1.2 (0.0)	1.5 (0.0)	1.6 (0.0)
	Medicaid-only	2.2 (0.1)	2.1 (0.1)	2.2 (0.1)	2.0 (0.1)
Equipment, technology, and modifications use	Dual eligibles	22.3 (0.2)	21.3 (0.2)	24.9 (0.2)	25.1 (0.2)
	Medicaid-only	33.8 (0.5)	28.1 (0.4)	29.1 (0.3)	30.5 (0.3)

Note: This table presents regression-adjusted means for New Mexico MLTSS enrollees. Results are presented separately for dual eligible and Medicaid-only beneficiaries. Estimates for all outcomes are expressed as percentages per month.

HCBS = home- and community-based services; MLTSS = managed long-term services and supports; SE = standard error.

[a] New Mexico does not require that MLTSS plans cover home-delivered meals; however, some plans offer meals as value-added service.

Table B.12. Regression-adjusted utilization for New York MAP for specific HCBS

Outcome	Year 1 (July 2015–Dec 2015) Mean (SE)	Year 2 (Jan 2016–Dec 2016) Mean (SE)	Year 3 (Jan 2017–Dec 2017) Mean (SE)
Round-the-clock services use	n/a	n/a	n/a
Day services use	5.8 (0.3)	5.2 (0.3)	3.8 (0.2)
Home-delivered meals use	1.6 (0.1)	1.9 (0.2)	1.7 (0.1)
Home-based services use	61.0 (0.6)	65.0 (0.6)	64.4 (0.5)
Caregiver support services use	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Equipment, technology, and modifications use	52.8 (0.6)	52.9 (0.6)	52.0 (0.5)

Note: This table presents regression-adjusted means for New York MAP enrollees. Only dual eligible beneficiaries are enrolled in the New York MAP program. Estimates are expressed as percentages per month.

HCBS = home and community-based services; MAP = Medicaid Advantage Plus; MLTSS = managed long-term services and supports; n/a = not applicable (service is covered through Medicaid FFS); SE = standard error

3.   Service utilization in MLTSS vs. matched comparison states

In this section, we include regression-adjusted mean outcomes for specific HCBS for Florida Statewide Medicaid Managed Care Long-Term Care Program (Table B.13), Kansas KanCare (MLTSS component) (Table B.14), and Tennessee TennCare CHOICES in Long-Term Care (Table B.15).

Table B.13. MLTSS estimates on specific HCBS use for Florida Statewide Medicaid Managed Care Long-Term Care Program

Measure	Population	Year 1 (Oct 2014–Sep 2015)			Year 2 (Oct 2015–Sep 2016)			Year 3 (Oct 2016–Sep 2017)			Partial Year 4 (Oct–Dec 2017)		
		MLTSS (SE)	FFS (SE)	Diff. (SE)	MLTSS (SE)	FFS (SE)	Diff. (SE)	MLTSS (SE)	FFS (SE)	Diff. (SE)	MLTSS (SE)	FFS (SE)	Diff. (SE)
Round-the-clock services use	Dual eligibles	13.4 (0.1)	0.0 (0.0)	**13.4 (0.1)**	13.2 (0.1)	0.0 (0.0)	**13.2 (0.1)**	13.3 (0.1)	0.0 (0.0)	**13.3 (0.1)**	13.4 (0.1)	0.0 (0.0)	**13.4 (0.1)**
	Medicaid-only	6.5 (0.3)	0.0 (0.0)	**6.5 (0.3)**	8.4 (0.3)	0.0 (0.0)	**8.4 (0.3)**	10.2 (0.3)	0.0 (0.0)	**10.2 (0.3)**	10.4 (0.4)	0.0 (0.0)	**10.4 (0.4)**
Day services use	Dual eligibles	3.9 (0.1)	0.1 (0.0)	**3.8 (0.1)**	4.0 (0.1)	0.1 (0.0)	**3.9 (0.1)**	3.8 (0.1)	0.2 (0.0)	**3.6 (0.1)**	3.9 (0.1)	3.8 (0.2)	**0.1 (0.2)**
	Medicaid-only	2.0 (0.2)	0.7 (0.1)	**1.3 (0.2)**	2.7 (0.2)	0.7 (0.1)	**2.0 (0.2)**	2.9 (0.2)	0.9 (0.2)	**2.0 (0.2)**	3.4 (0.2)	7.3 (0.7)	**-3.9 (0.7)**
Home-delivered meals use	Dual eligibles	13.2 (0.1)	13.6 (0.3)	**-0.4 (0.3)**	13.4 (0.1)	14.1 (0.3)	**-0.7 (0.3)**	13.9 (0.1)	15.0 (0.3)	**-1.2 (0.3)**	12.9 (0.1)	15.4 (0.3)	**-2.5 (0.3)**
	Medicaid-only	12.5 (0.5)	22.2 (1.3)	**-9.6 (1.4)**	12.6 (0.4)	19.0 (1.1)	**-6.4 (1.2)**	14.6 (0.4)	20.5 (1.1)	**-5.9 (1.1)**	13.9 (0.4)	21.4 (1.2)	**-7.5 (1.3)**
Home-based services use	Dual eligibles	34.6 (0.2)	28.8 (0.4)	**5.8 (0.4)**	34.2 (0.1)	29.1 (0.4)	**5.1 (0.4)**	35.0 (0.1)	30.2 (0.4)	**4.8 (0.4)**	34.8 (0.1)	31.2 (0.4)	**3.6 (0.4)**
	Medicaid-only	28.2 (0.6)	43.8 (1.5)	**-15.6 (1.6)**	29.3 (0.5)	38.6 (1.3)	**-9.2 (1.4)**	33.6 (0.5)	38.9 (1.2)	**-5.3 (1.3)**	34.1 (0.5)	39.7 (1.4)	**-5.6 (1.5)**
Caregiver support services use	Dual eligibles	4.5 (0.1)	0.0 (0.0)	**4.4 (0.1)**	4.6 (0.1)	0.0 (0.0)	**4.6 (0.1)**	4.6 (0.1)	0.0 (0.0)	**4.6 (0.1)**	4.2 (0.1)	0.0 (0.0)	**4.2 (0.1)**
	Medicaid-only	4.4 (0.3)	0.1 (0.1)	**4.3 (0.3)**	4.8 (0.3)	0.1 (0.0)	**4.7 (0.3)**	4.4 (0.2)	0.1 (0.0)	**4.4 (0.2)**	3.9 (0.2)	0.1 (0.0)	**3.8 (0.2)**

Table B.13 *(continued)*

		Year 1 (Oct 2014–Sep 2015)			Year 2 (Oct 2015–Sep 2016)			Year 3 (Oct 2016–Sep 2017)			Partial Year 4 (Oct–Dec 2017)		
Equipment, technology, and modifications use	Dual eligibles	21.3 (0.1)	19.0 (0.4)	**2.3 (0.4)**	21.9 (0.1)	19.4 (0.3)	**2.5 (0.3)**	24.0 (0.1)	20.6 (0.3)	**3.4 (0.3)**	23.6 (0.1)	20.8 (0.3)	**2.8 (0.4)**
	Medicaid-only	24.9 (0.5)	30.8 (1.4)	**-5.8 (1.5)**	26.5 (0.5)	29.2 (1.4)	**-2.6 (1.5)**	30.3 (0.5)	28.3 (1.1)	**1.9 (1.2)**	29.4 (0.5)	28.1 (1.3)	**1.3 (1.4)**

Note: This table presents regression-adjusted means for Florida MLTSS enrollees under MLTSS and the FFS counterfactual, and the difference between the two groups (the model estimate). The FFS counterfactual is defined as the expected mean outcome of the MLTSS enrollees had they lived in South Carolina and participated in that state's FFS LTSS program. Results are presented separately for dual eligible and Medicaid-only beneficiaries. Estimates for all outcomes are expressed as percentages per month.

Diff. = difference; FFS = fee-for-service; HCBS = home- and community-based services; MLTSS = managed long-term services and supports; SE = standard error.

Table B.14. MLTSS estimates on specific HCBS use for Kansas KanCare (MLTSS component)

Measure	Population	Year 1 (Jan 2015–Dec 2015)			Year 2 (Jan 2016–Dec 2016)			Year 3 (Jan 2017–Dec 2017)		
		MLTSS (SE)	FFS (SE)	Diff. (SE)	MLTSS (SE)	FFS (SE)	Diff. (SE)	MLTSS (SE)	FFS (SE)	Diff. (SE)
Round-the-clock services use	Dual eligibles	19.9 (0.2)	14.0 (0.4)	**5.9 (0.4)**	20.1 (0.2)	13.2 (0.3)	**7.0 (0.4)**	20.5 (0.2)	13.2 (0.4)	**7.4 (0.4)**
	Medicaid-only	20.9 (0.5)	26.7 (1.0)	**-5.9 (1.1)**	20.1 (0.5)	22.5 (1.0)	**-2.3 (1.1)**	19.3 (0.5)	20.9 (1.0)	**-1.5 (1.1)**
Day services use	Dual eligibles	18.0 (0.2)	9.5 (0.3)	**8.4 (0.4)**	18.2 (0.2)	7.7 (0.3)	**10.4 (0.4)**	18.5 (0.2)	7.7 (0.3)	**10.8 (0.3)**
	Medicaid-only	30.2 (0.5)	13.4 (0.9)	**16.9 (1.0)**	29.3 (0.5)	8.5 (0.6)	**20.9 (0.8)**	28.1 (0.4)	8.3 (0.7)	**19.9 (0.8)**
Home-delivered meals use	Dual eligibles	4.1 (0.1)	25.3 (0.4)	**-21.2 (0.4)**	4.6 (0.1)	23.7 (0.4)	**-19.1 (0.4)**	4.8 (0.1)	23.3 (0.4)	**-18.5 (0.4)**
	Medicaid-only	8.6 (0.4)	20.7 (0.9)	**-12.1 (1.0)**	9.4 (0.4)	22.4 (0.8)	**-13.0 (0.9)**	10.2 (0.4)	21.8 (0.9)	**-11.6 (0.9)**
Home-based services use	Dual eligibles	53.4 (0.2)	35.9 (0.5)	**17.5 (0.5)**	54.8 (0.2)	34.5 (0.5)	**20.4 (0.6)**	55.3 (0.2)	33.6 (0.5)	**21.7 (0.6)**
	Medicaid-only	76.8 (0.5)	24.0 (1.0)	**52.9 (1.1)**	77.0 (0.5)	27.9 (1.0)	**49.2 (1.1)**	76.1 (0.5)	29.4 (1.0)	**46.7 (1.1)**
Caregiver support services use	Dual eligibles	0.0 (0.0)	3.0 (0.2)	**-3.0 (0.2)**	0.0 (0.0)	2.6 (0.2)	**-2.6 (0.2)**	0.0 (0.0)	2.8 (0.2)	**-2.8 (0.2)**
	Medicaid-only	0.1 (0.0)	6.5 (0.6)	**-6.4 (0.6)**	0.2 (0.0)	3.6 (0.3)	**-3.5 (0.3)**	0.2 (0.0)	4.0 (0.4)	**-3.8 (0.4)**
Equipment, technology, and modifications use	Dual eligibles	19.1 (0.2)	34.1 (0.4)	**-15.0 (0.5)**	19.8 (0.2)	32.2 (0.5)	**-12.4 (0.5)**	21.1 (0.2)	31.7 (0.4)	**-10.6 (0.5)**
	Medicaid-only	27.3 (0.5)	37.3 (1.1)	**-10.0 (1.2)**	28.3 (0.5)	35.3 (1.0)	**-7.1 (1.1)**	28.8 (0.5)	36.0 (1.0)	**-7.3 (1.1)**

Note: This table presents regression-adjusted means for Kansas MLTSS enrollees under MLTSS and the FFS counterfactual, and the difference between the two groups (the model estimate). The FFS counterfactual is defined as the expected mean outcome of the MLTSS enrollees had they lived in Oklahoma and participated in that state's FFS LTSS program. Results are presented separately for dually eligible and Medicaid-only beneficiaries. Estimates for all outcomes are expressed as percentages per month.

Diff. = difference; FFS = fee-for-service; HCBS = home- and community-based services; MLTSS = managed long-term services and supports; SE = standard error.

Table B.15. MLTSS estimates on specific HCBS use for Tennessee TennCare CHOICES in Long-Term Care

Measure	Population	Year 1 (Oct 2015–Dec 2015)			Year 2 (Jan 2016–Dec 2016)			Year 3 (Jan 2017–Dec 2017)		
		MLTSS (SE)	FFS (SE)	Diff. (SE)	MLTSS (SE)	FFS (SE)	Diff. (SE)	MLTSS (SE)	FFS (SE)	Diff. (SE)
Round-the-clock services use	Dual eligibles	0.0 (0.0)	3.5 (0.1)	**-3.5 (0.1)**	0.0 (0.0)	3.2 (0.1)	**-3.2 (0.1)**	0.0 (0.0)	3.5 (0.1)	**-3.5 (0.1)**
	Medicaid-only	0.1 (0.0)	6.2 (0.3)	**-6.2 (0.4)**	0.0 (0.0)	5.6 (0.2)	**-5.6 (0.2)**	0.0 (0.0)	6.0 (0.2)	**-5.9 (0.2)**
Day services use	Dual eligibles	0.0 (0.0)	5.0 (0.1)	**-5.0 (0.1)**	0.0 (0.0)	5.3 (0.1)	**-5.3 (0.1)**	0.0 (0.0)	5.9 (0.1)	**-5.9 (0.1)**
	Medicaid-only	0.0 (0.0)	13.8 (0.4)	**-13.8 (0.4)**	0.0 (0.0)	12.1 (0.3)	**-12.1 (0.3)**	0.1 (0.0)	12.8 (0.4)	**-12.7 (0.4)**
Home-delivered meals use	Dual eligibles	0.0 (0.0)	10.9 (0.2)	**-10.9 (0.2)**	0.0 (0.0)	10.2 (0.2)	**-10.2 (0.2)**	0.0 (0.0)	9.2 (0.2)	**-9.2 (0.2)**
	Medicaid-only	0.0 (0.0)	16.9 (0.6)	**-16.9 (0.6)**	0.0 (0.0)	15.5 (0.5)	**-15.5 (0.5)**	0.0 (0.0)	14.9 (0.5)	**-14.9 (0.5)**
Home-based services use	Dual eligibles	18.4 (0.2)	21.8 (0.3)	**-3.4 (0.3)**	20.5 (0.2)	23.1 (0.2)	**-2.6 (0.3)**	22.0 (0.2)	23.7 (0.3)	**-1.7 (0.3)**
	Medicaid-only	28.9 (0.7)	34.7 (0.7)	**-5.8 (1.0)**	27.4 (0.6)	33.3 (0.6)	**-5.9 (0.9)**	29.4 (0.6)	37.7 (0.8)	**-8.3 (1.0)**
Caregiver support services use	Dual eligibles	0.0 (0.0)	0.1 (0.0)	**-0.1 (0.0)**	0.0 (0.0)	0.1 (0.0)	**-0.1 (0.0)**	0.5 (0.0)	0.1 (0.0)	**0.4 (0.0)**
	Medicaid-only	0.1 (0.0)	0.4 (0.0)	**-0.4 (0.0)**	0.0 (0.0)	0.4 (0.0)	**-0.4 (0.0)**	0.7 (0.1)	0.5 (0.0)	**0.2 (0.1)**
Equipment, technology, and modifications use	Dual eligibles	8.0 (0.2)	10.5 (0.2)	**-2.5 (0.3)**	8.3 (0.1)	10.9 (0.2)	**-2.7 (0.2)**	8.1 (0.1)	10.8 (0.2)	**-2.7 (0.2)**
	Medicaid-only	27.8 (0.7)	21.1 (0.5)	**6.6 (0.9)**	26.2 (0.6)	20.4 (0.5)	**5.9 (0.7)**	26.4 (0.6)	22.6 (0.6)	**3.7 (0.8)**

Note: This table presents regression-adjusted means for Tennessee MLTSS enrollees under MLTSS and the FFS counterfactual, and the difference between the two groups (the model estimate). The FFS counterfactual is defined as the expected mean outcome of the MLTSS enrollees had they lived in Georgia and participated in that state's FFS LTSS program. Results are presented separately for dually eligible and Medicaid-only beneficiaries. Estimates for all outcomes are expressed as percentages per month.

Diff. = difference; FFS = fee-for-service; HCBS = home- and community-based services; MLTSS = managed long-term services and supports; SE = standard error.

F. Detailed regression results for each model

In this section, we present estimated regression coefficients for models for each of the five MLTSS programs evaluated (Tables B.16 to B.20).

Table B.16. Estimated regression coefficients for the models used to evaluate the Florida Statewide Medicaid Managed Care Long-Term Care program

	Nursing facility use	HCBS use	Round-the-clock services use	Day services use	Home-delivered meals use	Home-based services use	Caregiver support services use	Equipment, technology, and modifications use	Inpatient hospital days	Potentially avoidable hospitalizations
Intercept	-2.43 (0.18)	0.26 (0.16)	-11.64 (0.62)	-5.74 (0.34)	-3.12 (0.19)	0.08 (0.16)	-5.89 (0.62)	-1.19 (0.16)	51.08 (5.55)	-3.33 (0.70)
Age	0.05 (0.00)	-0.03 (0.00)	0.03 (0.00)	-0.04 (0.00)	0.01 (0.00)	-0.03 (0.00)	-0.04 (0.00)	-0.03 (0.00)	-0.21 (0.02)	-0.02 (0.00)
Age:age category	-0.06 (0.01)	0.05 (0.01)	-0.06 (0.01)	0.08 (0.01)	-0.03 (0.02)	0.06 (0.01)	0.10 (0.01)	0.03 (0.01)	0.12 (0.06)	0.04 (0.02)
Age:age category:dual	0.05 (0.01)	-0.04 (0.01)	0.02 (0.01)	-0.06 (0.01)	0.01 (0.02)	-0.05 (0.01)	-0.05 (0.01)	-0.03 (0.01)	--	--
Age:dual	-0.01 (0.00)	0.01 (0.00)	0.00 (0.01)	0.02 (0.01)	0.00 (0.00)	0.01 (0.00)	0.01 (0.01)	0.01 (0.00)	--	--
Age category	3.95 (0.79)	-3.14 (0.82)	3.65 (0.87)	-4.46 (0.73)	2.03 (1.38)	-3.64 (0.85)	-6.35 (0.90)	-2.05 (0.98)	-5.83 (4.56)	-2.77 (1.16)
Age category:dual	-3.18 (0.80)	2.69 (0.83)	-1.00 (0.89)	4.05 (0.77)	-0.32 (1.39)	3.07 (0.87)	3.26 (0.93)	1.68 (0.99)	--	--
CCW PC 1	-0.03 (0.00)	0.03 (0.00)	0.00 (0.00)	0.03 (0.00)	0.02 (0.00)	0.02 (0.00)	0.03 (0.00)	0.02 (0.00)	-0.56 (0.03)	-0.05 (0.00)
CCW PC 2	0.00 (0.00)	0.00 (0.00)	0.02 (0.00)	-0.01 (0.00)	0.00 (0.00)	0.00 (0.00)	-0.01 (0.00)	-0.01 (0.00)	-0.33 (0.04)	-0.05 (0.00)
CCW PC 3	-0.04 (0.00)	0.04 (0.00)	-0.01 (0.00)	-0.01 (0.00)	0.04 (0.00)	0.04 (0.00)	0.01 (0.00)	0.04 (0.00)	0.17 (0.04)	0.03 (0.01)
CCW PC 4	-0.02 (0.00)	0.01 (0.00)	0.00 (0.00)	-0.01 (0.00)	0.02 (0.00)	0.02 (0.00)	-0.01 (0.00)	0.02 (0.00)	0.07 (0.03)	0.00 (0.00)
CCW PC 5	0.00 (0.00)	0.00 (0.00)	-0.01 (0.00)	0.02 (0.00)	0.00 (0.00)	0.01 (0.00)	0.02 (0.00)	0.01 (0.00)	-0.31 (0.04)	-0.03 (0.00)
CCW PC 6	0.04 (0.00)	-0.04 (0.00)	-0.02 (0.00)	-0.02 (0.00)	-0.04 (0.00)	-0.04 (0.00)	-0.01 (0.00)	-0.03 (0.00)	0.12 (0.04)	-0.01 (0.00)
CCW PC 7	0.00 (0.00)	0.00 (0.00)	-0.02 (0.00)	0.00 (0.00)	0.01 (0.00)	0.01 (0.00)	0.02 (0.00)	0.02 (0.00)	0.09 (0.07)	0.00 (0.01)

Table B.16 *(continued)*

	Nursing facility use	HCBS use	Round-the-clock services use	Day services use	Home-delivered meals use	Home-based services use	Caregiver support services use	Equipment, technology, and modifications use	Inpatient hospital days	Potentially avoidable hospitalizations
CCW PC 8	0.00 (0.00)	0.01 (0.00)	0.00 (0.00)	0.04 (0.00)	0.01 (0.00)	0.01 (0.00)	0.01 (0.00)	0.01 (0.00)	-0.54 (0.05)	-0.03 (0.01)
CCW PC 9	0.01 (0.00)	-0.01 (0.00)	-0.01 (0.00)	-0.01 (0.00)	0.00 (0.00)	0.00 (0.00)	0.02 (0.00)	0.01 (0.00)	0.20 (0.05)	0.01 (0.01)
CCW PC 10	-0.01 (0.00)	0.01 (0.00)	0.00 (0.00)	0.00 (0.00)	0.01 (0.00)	0.01 (0.00)	0.01 (0.00)	0.02 (0.00)	0.16 (0.05)	0.00 (0.01)
Missing CCW Indicator	-1.47 (0.26)	0.33 (0.17)	-0.90 (0.28)	1.36 (0.18)	0.25 (0.16)	0.47 (0.17)	1.70 (0.20)	0.01 (0.17)	-25.82 (1.25)	-5.95 (1.01)
Dual and Medicare Managed Care enrolled	-1.15 (0.10)	0.84 (0.10)	-0.22 (0.09)	0.34 (0.17)	0.71 (0.12)	0.80 (0.11)	0.23 (0.15)	0.79 (0.10)	--	--
Dual and not Medicare Managed Care enrolled	0.10 (0.09)	-0.01 (0.10)	0.54 (0.09)	-0.34 (0.16)	-0.17 (0.12)	-0.08 (0.10)	-0.22 (0.15)	-0.06 (0.10)	--	--
Proportion of prior year dual	-0.05 (0.05)	-0.02 (0.05)	0.63 (0.06)	0.19 (0.11)	-0.17 (0.06)	-0.08 (0.05)	0.12 (0.08)	-0.18 (0.05)	-0.73 (1.52)	-0.52 (0.25)
Missing prior year dual eligibility	1.24 (0.19)	-1.89 (0.33)	-7.21 (0.94)	-8.03 (0.18)	-2.64 (0.63)	-1.84 (0.33)	-7.43 (0.23)	-2.46 (0.43)	15.51 (13.29)	0.29 (0.59)
Dual	1.11 (0.20)	-0.84 (0.17)	-0.67 (1.15)	-2.72 (0.41)	0.11 (0.19)	-0.69 (0.17)	-1.87 (0.66)	-0.53 (0.16)	--	--
Male	0.20 (0.02)	-0.21 (0.02)	0.12 (0.02)	-0.10 (0.03)	-0.17 (0.02)	-0.21 (0.02)	-0.08 (0.03)	-0.44 (0.02)	1.09 (0.50)	0.01 (0.09)
Proportion of prior year Medicare Managed Care enrollment	0.63 (0.03)	-0.33 (0.03)	0.27 (0.02)	-0.42 (0.05)	-0.18 (0.04)	-0.31 (0.03)	-0.53 (0.04)	-0.27 (0.03)	-2.80 (9.12)	1.11 (1.03)
Missing prior year Medicare Managed Care enrollment	0.10 (0.09)	-0.06 (0.10)	0.30 (0.08)	0.13 (0.16)	-0.14 (0.11)	-0.16 (0.10)	-0.55 (0.15)	0.02 (0.10)	-0.52 (4.71)	1.60 (0.58)
Proportion of prior year Medicaid enrolled	-0.61 (0.06)	0.16 (0.06)	-0.65 (0.06)	0.49 (0.12)	0.30 (0.08)	0.09 (0.06)	0.01 (0.09)	0.47 (0.06)	-11.16 (2.65)	-0.64 (0.27)

Table B.16 *(continued)*

	Nursing facility use	HCBS use	Round-the-clock services use	Day services use	Home-delivered meals use	Home-based services use	Caregiver support services use	Equipment, technology, and modifications use	Inpatient hospital days	Potentially avoidable hospitalizations
MLTSS	1.39 (0.09)	-0.25 (0.08)	7.78 (0.57)	1.13 (0.22)	-0.73 (0.09)	-0.79 (0.08)	3.99 (0.59)	-0.32 (0.08)	-7.12 (0.94)	-0.65 (0.12)
MLTSS:dual	-1.47 (0.10)	1.21 (0.08)	0.20 (1.11)	2.77 (0.28)	0.69 (0.10)	1.12 (0.08)	1.52 (0.63)	0.49 (0.08)	--	--
Year 2	0.35 (0.10)	-0.02 (0.08)	0.92 (0.79)	0.08 (0.20)	-0.20 (0.09)	-0.25 (0.08)	-0.35 (0.92)	-0.08 (0.08)	-3.83 (1.26)	-0.36 (0.16)
Year 2:dual	-0.09 (0.10)	0.07 (0.09)	-2.47 (0.85)	-0.17 (0.25)	0.25 (0.10)	0.27 (0.08)	0.38 (0.96)	0.12 (0.09)	--	--
Year 2:MLTSS	-0.56 (0.10)	0.15 (0.09)	-0.63 (0.79)	0.23 (0.21)	0.21 (0.10)	0.31 (0.08)	0.43 (0.92)	0.18 (0.09)	5.36 (1.24)	0.21 (0.17)
Year 2:MLTSS: dual	0.26 (0.11)	-0.25 (0.09)	2.16 (0.85)	-0.14 (0.26)	-0.24 (0.10)	-0.35 (0.08)	-0.43 (0.96)	-0.16 (0.09)	--	--
Year 3	0.46 (0.10)	-0.04 (0.08)	0.60 (0.50)	0.30 (0.20)	-0.11 (0.09)	-0.23 (0.08)	-0.21 (0.79)	-0.13 (0.08)	-5.02 (1.47)	-0.53 (0.17)
Year 3: dual	-0.18 (0.11)	0.16 (0.08)	-2.41 (1.03)	0.43 (0.32)	0.24 (0.10)	0.32 (0.08)	0.15 (0.89)	0.25 (0.08)	--	--
Year 3: MLTSS	-0.88 (0.11)	0.39 (0.09)	-0.10 (0.51)	0.10 (0.22)	0.30 (0.10)	0.52 (0.09)	0.21 (0.79)	0.43 (0.09)	5.11 (1.41)	0.30 (0.19)
Year 3:MLTSS: dual	0.42 (0.11)	-0.51 (0.09)	1.90 (1.03)	-0.87 (0.34)	-0.36 (0.11)	-0.58 (0.09)	-0.12 (0.89)	-0.36 (0.09)	--	--
Year 4	0.38 (0.11)	-0.13 (0.09)	2.02 (1.00)	2.60 (0.21)	-0.05 (0.10)	-0.20 (0.09)	-0.20 (0.74)	-0.14 (0.09)	-6.01 (1.25)	-0.52 (0.20)
Year 4:dual	-0.20 (0.11)	0.32 (0.09)	-6.10 (1.71)	1.28 (0.27)	0.21 (0.11)	0.34 (0.09)	0.11 (0.83)	0.28 (0.10)	--	--
Year 4:MLTSS	-0.81 (0.11)	0.48 (0.09)	-1.49 (1.01)	-2.03 (0.23)	0.17 (0.11)	0.51 (0.10)	0.06 (0.74)	0.40 (0.10)	4.85 (1.21)	0.19 (0.21)
Year 4:MLTSS: dual	0.27 (0.11)	-0.70 (0.10)	5.58 (1.71)	-1.86 (0.29)	-0.36 (0.12)	-0.65 (0.10)	-0.03 (0.83)	-0.37 (0.11)	--	--
Black	-0.30 (0.02)	0.25 (0.02)	-0.82 (0.03)	0.88 (0.05)	0.47 (0.02)	0.29 (0.02)	0.51 (0.04)	0.38 (0.02)	1.42 (0.72)	0.32 (0.11)

Table B.16 *(continued)*

	Nursing facility use	HCBS use	Round-the-clock services use	Day services use	Home-delivered meals use	Home-based services use	Caregiver support services use	Equipment, technology, and modifications use	Inpatient hospital days	Potentially avoidable hospitalizations
Hispanic	-1.40 (0.02)	1.25 (0.02)	-0.30 (0.02)	1.99 (0.04)	0.86 (0.02)	1.30 (0.02)	1.11 (0.03)	0.93 (0.02)	1.02 (0.50)	0.62 (0.19)
Other race	-0.77 (0.03)	0.49 (0.03)	-0.18 (0.03)	1.12 (0.05)	0.37 (0.04)	0.51 (0.03)	0.75 (0.04)	0.38 (0.03)	0.57 (0.68)	0.16 (0.13)
Completely rural	0.35 (0.10)	-0.13 (0.12)	-0.49 (0.17)	-2.12 (0.36)	0.46 (0.15)	-0.08 (0.12)	-1.18 (0.42)	-0.18 (0.11)	-2.07 (2.21)	-0.63 (0.31)
Missing residential area	-0.81 (0.17)	-0.16 (0.14)	0.27 (0.18)	0.08 (0.31)	-0.05 (0.17)	-0.19 (0.15)	-0.17 (0.26)	-0.14 (0.15)	-3.89 (1.82)	0.14 (0.33)
Mostly rural	0.27 (0.02)	-0.29 (0.02)	-1.59 (0.06)	-0.86 (0.09)	0.06 (0.03)	-0.24 (0.02)	-0.54 (0.08)	-0.06 (0.02)	-1.77 (0.59)	0.02 (0.10)
Proportion of prior year study eligible	-0.16 (0.02)	0.67 (0.02)	-0.01 (0.02)	0.00 (0.03)	0.66 (0.02)	0.88 (0.02)	-0.05 (0.02)	0.67 (0.02)	-1.83 (0.90)	-0.05 (0.12)

Notes: Each column in the table corresponds to a different outcome, and each row to a different term in the model. All estimated coefficients are expressed as Estimate (standard error). The colon (:) symbol is used to represent interactions between variables. "--" indicates the term was not included in the model.

Year 1 corresponds to October 2014 through September 2015, Year 2 to October 2015 through September 2016, Year 3 to October 2016 through September 2017, and Year 4 to October 2017 through December 2017.

CCW = Chronic Conditions Data Warehouse; HCBS = home- and community-based services; MLTSS = managed long-term services and supports; PC = principal component.

Table B.17. Estimated regression coefficients for the models used to evaluate the Kansas KanCare (MLTSS component) Program

	Nursing facility use	HCBS use	Round-the-clock services use	Day services use	Home-delivered meals use	Home-based services use	Caregiver support services use	Equipment, technology, and modifications use	Inpatient hospital days	Potentially avoidable hospitalizations
Intercept	-3.46 (0.23)	0.07 (0.17)	-0.24 (0.23)	-2.59 (0.24)	-4.97 (0.21)	-3.11 (0.16)	-2.32 (0.67)	-2.75 (0.15)	19.02 (2.52)	-5.13 (0.70)
Age	0.07 (0.00)	-0.03 (0.00)	-0.06 (0.00)	-0.06 (0.00)	0.04 (0.00)	0.00 (0.00)	-0.06 (0.01)	0.02 (0.00)	0.01 (0.01)	0.01 (0.01)
Age:age category	-0.08 (0.01)	0.02 (0.01)	0.03 (0.02)	0.04 (0.04)	-0.04 (0.01)	-0.01 (0.01)	0.20 (0.04)	-0.03 (0.01)	-0.13 (0.06)	0.00 (0.02)
Age:age Category:dual	0.05 (0.01)	-0.03 (0.01)	-0.01 (0.02)	-0.11 (0.04)	-0.04 (0.01)	-0.03 (0.01)	-0.19 (0.04)	-0.02 (0.01)	--	--
Age:dual	0.01 (0.00)	0.00 (0.00)	0.05 (0.00)	0.05 (0.00)	0.01 (0.00)	0.01 (0.00)	0.03 (0.01)	0.01 (0.00)	--	--
Age category	5.58 (0.76)	-1.67 (0.66)	-0.91 (1.27)	-2.15 (2.57)	1.35 (1.00)	0.39 (0.67)	-15.50 (2.99)	1.40 (0.65)	8.23 (4.53)	0.01 (1.08)
Age Category:dual	-3.57 (0.80)	2.19 (0.68)	-0.47 (1.29)	6.35 (2.60)	3.42 (1.03)	2.10 (0.69)	14.44 (3.24)	1.82 (0.67)	--	--
CCW PC 1	-0.04 (0.00)	0.04 (0.00)	0.02 (0.00)	0.04 (0.00)	0.02 (0.00)	0.03 (0.00)	0.00 (0.00)	0.01 (0.00)	-0.23 (0.02)	-0.03 (0.00)
CCW PC 2	0.00 (0.00)	0.00 (0.00)	-0.07 (0.00)	-0.08 (0.00)	0.04 (0.00)	0.01 (0.00)	-0.08 (0.01)	0.02 (0.00)	0.15 (0.02)	0.06 (0.00)
CCW PC 3	-0.08 (0.00)	0.07 (0.00)	0.00 (0.00)	-0.02 (0.00)	0.07 (0.00)	0.07 (0.00)	0.01 (0.01)	0.06 (0.00)	0.17 (0.03)	0.03 (0.01)
CCW PC 4	-0.01 (0.00)	0.01 (0.00)	-0.05 (0.00)	-0.05 (0.00)	0.05 (0.00)	0.02 (0.00)	-0.04 (0.01)	0.02 (0.00)	-0.08 (0.02)	0.00 (0.00)
CCW PC 5	0.02 (0.00)	-0.01 (0.00)	0.07 (0.00)	0.08 (0.00)	-0.04 (0.00)	-0.02 (0.00)	0.07 (0.01)	-0.02 (0.00)	0.01 (0.02)	0.02 (0.01)
CCW PC 6	0.00 (0.00)	0.01 (0.00)	0.02 (0.00)	0.03 (0.00)	0.00 (0.00)	0.00 (0.00)	0.02 (0.01)	0.00 (0.00)	-0.23 (0.03)	0.00 (0.01)
CCW PC 7	0.00 (0.00)	0.00 (0.00)	-0.01 (0.00)	-0.01 (0.00)	0.01 (0.00)	0.01 (0.00)	-0.02 (0.01)	0.02 (0.00)	0.01 (0.02)	0.00 (0.01)

Table B.17 *(continued)*

	Nursing facility use	HCBS use	Round-the-clock services use	Day services use	Home-delivered meals use	Home-based services use	Caregiver support services use	Equipment, technology, and modifications use	Inpatient hospital days	Potentially avoidable hospitalizations
CCW PC 8	0.01 (0.00)	-0.02 (0.00)	-0.04 (0.00)	-0.04 (0.00)	0.00 (0.00)	-0.01 (0.00)	0.00 (0.01)	-0.01 (0.00)	0.12 (0.03)	0.02 (0.01)
CCW PC 9	0.00 (0.00)	0.01 (0.00)	0.04 (0.00)	0.04 (0.00)	-0.02 (0.00)	0.00 (0.00)	0.05 (0.01)	0.00 (0.00)	0.08 (0.04)	0.02 (0.01)
CCW PC 10	0.03 (0.00)	-0.03 (0.00)	0.01 (0.00)	-0.01 (0.00)	-0.03 (0.00)	-0.02 (0.00)	-0.01 (0.01)	-0.01 (0.00)	0.11 (0.03)	0.02 (0.01)
Missing CCW	-1.51 (0.14)	0.68 (0.12)	0.82 (0.18)	1.82 (0.14)	0.10 (0.19)	0.53 (0.11)	-0.74 (0.53)	-0.84 (0.14)	-10.12 (0.73)	-2.33 (0.33)
Dual and Medicare Managed Care enrolled	0.65 (0.15)	0.40 (0.13)	-0.87 (0.20)	-0.82 (0.20)	0.59 (0.18)	0.45 (0.13)	-2.15 (0.45)	0.59 (0.12)	--	--
Dual and not Medicare Managed Care enrolled	0.91 (0.14)	0.32 (0.12)	-0.51 (0.18)	-0.56 (0.15)	0.52 (0.16)	0.34 (0.12)	-1.18 (0.38)	0.35 (0.11)	--	--
Proportion of prior year dual	-0.70 (0.06)	0.62 (0.05)	-0.39 (0.08)	-0.09 (0.12)	0.51 (0.07)	0.52 (0.05)	-0.18 (0.25)	0.74 (0.05)	-4.85 (2.84)	-0.30 (0.93)
Missing prior year dual	0.20 (0.34)	-0.17 (0.24)	-0.70 (0.30)	0.24 (0.48)	-0.07 (0.28)	-0.24 (0.34)	0.22 (0.68)	0.28 (0.21)	-4.74 (1.82)	0.05 (0.52)
Dual	-1.58 (0.28)	0.57 (0.17)	-1.81 (0.19)	-1.51 (0.21)	-0.15 (0.22)	0.28 (0.14)	-0.84 (0.43)	-0.97 (0.15)	--	--
Male	0.31 (0.03)	-0.30 (0.02)	0.09 (0.04)	0.08 (0.04)	-0.18 (0.03)	-0.29 (0.03)	0.20 (0.10)	-0.52 (0.02)	0.88 (0.24)	0.13 (0.11)
Proportion of prior year Medicare Managed Care enrollment	0.63 (0.06)	-0.46 (0.05)	-0.25 (0.10)	-0.75 (0.14)	0.48 (0.08)	-0.27 (0.05)	0.21 (0.29)	0.12 (0.05)	-1.74 (1.96)	-51.03 (6.70)
Missing proportion of prior year Medicare Managed Care enrollment	1.27 (0.12)	0.06 (0.11)	-0.79 (0.17)	-0.77 (0.14)	0.95 (0.14)	0.25 (0.11)	-0.89 (0.37)	0.85 (0.10)	1.04 (2.27)	1.90 (0.65)

Table B.17 *(continued)*

	Nursing facility use	HCBS use	Round-the-clock services use	Day services use	Home-delivered meals use	Home-based services use	Caregiver support services use	Equipment, technology, and modifications use	Inpatient hospital days	Potentially avoidable hospitalizations
Proportion of prior year Medicaid enrolled	-0.24 (0.10)	0.37 (0.07)	0.14 (0.12)	0.90 (0.13)	0.15 (0.09)	0.88 (0.06)	1.46 (0.53)	0.01 (0.07)	-2.36 (0.89)	-0.60 (0.26)
Missing prior year Medicaid enrolled	-1.01 (0.38)	-0.19 (0.32)	1.45 (0.34)	-0.55 (0.66)	-0.91 (0.48)	-0.32 (0.43)	1.08 (1.03)	-1.42 (0.28)	7.46 (4.02)	-1.98 (0.79)
MLTSS	-1.83 (0.09)	0.77 (0.07)	-0.47 (0.09)	1.51 (0.11)	-1.19 (0.08)	2.54 (0.07)	-4.51 (0.25)	-0.52 (0.06)	-5.17 (0.57)	-1.13 (0.13)
MLTSS:dual	1.76 (0.09)	-1.06 (0.08)	1.11 (0.10)	-0.26 (0.12)	-1.25 (0.09)	-1.62 (0.07)	-0.16 (0.36)	-0.40 (0.06)	--	--
Year 2	-0.69 (0.08)	0.20 (0.07)	-0.34 (0.09)	-0.66 (0.11)	0.12 (0.08)	0.22 (0.06)	-0.70 (0.13)	-0.09 (0.06)	-2.55 (0.65)	-0.61 (0.15)
Year 2:dual	0.67 (0.09)	-0.24 (0.08)	0.24 (0.09)	0.32 (0.13)	-0.23 (0.08)	-0.29 (0.07)	0.54 (0.15)	-0.01 (0.07)	--	--
Year 2:MLTSS	0.50 (0.09)	-0.23 (0.07)	0.27 (0.09)	0.59 (0.11)	-0.02 (0.09)	-0.20 (0.07)	1.17 (0.27)	0.15 (0.06)	2.17 (0.67)	0.38 (0.18)
Year 2:MLTSS:dual	-0.52 (0.10)	0.28 (0.08)	-0.15 (0.10)	-0.22 (0.13)	0.26 (0.09)	0.36 (0.07)	-1.46 (0.38)	0.00 (0.07)	--	--
Year 3	-0.70 (0.09)	0.13 (0.08)	-0.47 (0.10)	-0.69 (0.13)	0.08 (0.08)	0.30 (0.07)	-0.59 (0.14)	-0.06 (0.07)	-3.26 (0.62)	-0.85 (0.14)
Year 3:dual	0.71 (0.09)	-0.25 (0.08)	0.37 (0.11)	0.34 (0.14)	-0.21 (0.09)	-0.42 (0.08)	0.51 (0.16)	-0.07 (0.07)	--	--
Year 3:MLTSS	0.48 (0.10)	-0.22 (0.08)	0.34 (0.10)	0.52 (0.13)	0.13 (0.10)	-0.34 (0.07)	1.08 (0.29)	0.14 (0.07)	2.07 (0.63)	0.31 (0.18)
Year 3:MLTSS:dual	-0.52 (0.11)	0.38 (0.09)	-0.18 (0.11)	-0.11 (0.15)	0.18 (0.11)	0.57 (0.08)	-1.58 (0.42)	0.13 (0.08)	--	--
Black	-0.58 (0.04)	0.36 (0.03)	-0.39 (0.05)	-0.17 (0.06)	0.31 (0.04)	0.28 (0.03)	-0.19 (0.14)	0.36 (0.03)	-0.16 (0.42)	0.16 (0.13)
Hispanic	-0.63 (0.07)	0.19 (0.07)	-0.44 (0.10)	-0.34 (0.12)	0.27 (0.09)	0.04 (0.06)	-0.53 (0.36)	0.17 (0.06)	-0.69 (0.47)	-0.17 (0.19)
Other race	-0.33 (0.05)	0.21 (0.04)	-0.40 (0.07)	-0.18 (0.08)	0.00 (0.07)	0.21 (0.04)	0.17 (0.15)	0.05 (0.04)	0.21 (0.39)	0.11 (0.17)

Table B.17 *(continued)*

	Nursing facility use	HCBS use	Round-the-clock services use	Day services use	Home-delivered meals use	Home-based services use	Caregiver support services use	Equipment, technology, and modifications use	Inpatient hospital days	Potentially avoidable hospitalizations
Completely rural	0.41 (0.06)	-0.36 (0.05)	-0.95 (0.09)	-0.85 (0.10)	0.24 (0.07)	-0.21 (0.05)	0.49 (0.26)	-0.08 (0.05)	-1.21 (0.45)	0.15 (0.22)
Missing residential area	0.54 (0.07)	-0.77 (0.07)	-0.18 (0.13)	-0.78 (0.13)	-0.86 (0.19)	-0.79 (0.07)	-0.95 (0.64)	-0.42 (0.07)	0.38 (0.52)	0.16 (0.33)
Mostly rural	0.01 (0.03)	-0.02 (0.02)	-0.25 (0.04)	-0.41 (0.04)	0.34 (0.03)	0.07 (0.02)	0.34 (0.08)	0.09 (0.02)	-0.29 (0.25)	0.19 (0.11)
Proportion of prior year study eligible	-0.46 (0.08)	0.78 (0.06)	1.47 (0.09)	1.21 (0.09)	-0.14 (0.08)	0.20 (0.05)	0.39 (0.18)	0.27 (0.06)	-4.04 (0.74)	-0.58 (0.21)

Notes: Each column in the table corresponds to a different outcome, and each row to a different term in the model. All estimated coefficients are expressed as Estimate (standard error). The colon (:) symbol is used to represent interactions between variables. "--" indicates the term was not included in the model.

Year 1 corresponds to January 2015 to December 2015, Year 2 to January 2016 to December 2016, and Year 3 to January 2017 to December 2017.

CCW = Chronic Conditions Data Warehouse; HCBS = home- and community-based services; MLTSS = managed long-term services and supports; PC = principal component.

Table B.18. Estimated regression coefficients for the models used to evaluate the Tennessee TennCare CHOICES in Long-Term Care Program

	Nursing facility use	HCBS use	Round-the-clock services use	Day services use	Home-delivered meals use	Home-based services use	Caregiver support services use	Equipment, technology, and modifications use	Inpatient hospital days	Potentially avoidable hospitalizations
Intercept	-3.04 (0.14)	0.96 (0.12)	-1.92 (0.37)	-2.01 (0.29)	-4.60 (0.23)	-1.20 (0.11)	-3.79 (0.43)	-1.38 (0.12)	16.27 (1.71)	-4.95 (0.58)
Age	0.05 (0.00)	-0.04 (0.00)	-0.03 (0.00)	-0.07 (0.00)	0.03 (0.00)	-0.01 (0.00)	-0.07 (0.01)	-0.02 (0.00)	0.00 (0.01)	0.01 (0.00)
Age:age category	-0.03 (0.01)	0.03 (0.01)	-0.04 (0.02)	0.09 (0.02)	-0.02 (0.01)	0.00 (0.01)	0.01 (0.03)	0.00 (0.01)	-0.11 (0.04)	0.01 (0.02)
Age:age category:dual	0.00 (0.01)	0.00 (0.01)	0.01 (0.02)	-0.08 (0.02)	-0.04 (0.01)	0.00 (0.01)	0.03 (0.03)	-0.01 (0.01)	--	--
Age:dual	0.00 (0.00)	-0.01 (0.00)	0.03 (0.00)	0.02 (0.00)	0.00 (0.00)	0.00 (0.00)	0.01 (0.01)	0.00 (0.00)	--	--
Age category	2.31 (0.55)	-1.80 (0.53)	2.64 (1.44)	-6.08 (1.48)	-0.21 (1.06)	0.19 (0.55)	0.41 (2.28)	-0.98 (0.76)	2.09 (3.20)	-1.72 (1.17)
Age Category:dual	-0.52 (0.57)	0.35 (0.54)	-0.79 (1.48)	4.84 (1.50)	4.55 (1.09)	0.69 (0.56)	-3.42 (2.32)	1.56 (0.77)	--	--
CCW PC 1	-0.03 (0.00)	0.04 (0.00)	0.02 (0.00)	0.06 (0.00)	0.03 (0.00)	0.03 (0.00)	0.03 (0.00)	0.03 (0.00)	-0.27 (0.04)	-0.02 (0.00)
CCW PC 2	-0.01 (0.00)	0.01 (0.00)	-0.04 (0.00)	-0.01 (0.00)	0.02 (0.00)	0.02 (0.00)	0.00 (0.00)	0.01 (0.00)	0.09 (0.02)	0.04 (0.00)
CCW PC 3	-0.04 (0.00)	0.05 (0.00)	0.00 (0.00)	-0.01 (0.00)	0.05 (0.00)	0.05 (0.00)	0.02 (0.00)	0.05 (0.00)	0.21 (0.03)	0.03 (0.01)
CCW PC 4	-0.01 (0.00)	0.01 (0.00)	-0.01 (0.00)	0.00 (0.00)	0.02 (0.00)	0.01 (0.00)	-0.01 (0.00)	0.01 (0.00)	-0.09 (0.03)	-0.01 (0.01)
CCW PC 5	0.02 (0.00)	-0.02 (0.00)	-0.01 (0.00)	-0.01 (0.00)	-0.02 (0.00)	-0.02 (0.00)	-0.01 (0.00)	-0.01 (0.00)	0.13 (0.03)	0.01 (0.00)
CCW PC 6	0.02 (0.00)	-0.02 (0.00)	0.03 (0.00)	0.04 (0.00)	-0.03 (0.00)	-0.02 (0.00)	-0.01 (0.00)	-0.02 (0.00)	-0.17 (0.07)	-0.02 (0.01)
CCW PC 7	0.00 (0.00)	-0.01 (0.00)	-0.01 (0.00)	-0.02 (0.00)	0.00 (0.00)	-0.01 (0.00)	0.00 (0.00)	0.00 (0.00)	0.21 (0.03)	0.04 (0.01)

Table B.18 *(continued)*

	Nursing facility use	HCBS use	Round-the-clock services use	Day services use	Home-delivered meals use	Home-based services use	Caregiver support services use	Equipment, technology, and modifications use	Inpatient hospital days	Potentially avoidable hospitalizations
CCW PC 8	0.02 (0.00)	-0.01 (0.00)	-0.05 (0.00)	-0.02 (0.00)	-0.01 (0.00)	0.00 (0.00)	0.01 (0.01)	0.01 (0.00)	-0.15 (0.04)	-0.01 (0.00)
CCW PC 9	-0.01 (0.00)	0.02 (0.00)	-0.01 (0.00)	0.03 (0.00)	0.02 (0.00)	0.02 (0.00)	0.02 (0.01)	0.02 (0.00)	-0.09 (0.04)	0.01 (0.01)
CCW PC 10	-0.02 (0.00)	0.02 (0.00)	0.07 (0.00)	0.08 (0.00)	0.00 (0.00)	0.01 (0.00)	0.02 (0.01)	0.00 (0.00)	-0.12 (0.04)	0.01 (0.01)
Missing CCW	-0.93 (0.08)	1.06 (0.08)	0.01 (0.26)	2.54 (0.13)	-0.24 (0.25)	0.64 (0.08)	1.76 (0.21)	-0.10 (0.09)	-9.65 (1.46)	-1.11 (0.33)
Dual and Medicare Managed Care enrolled	0.63 (0.05)	-0.28 (0.05)	-0.77 (0.19)	-0.37 (0.14)	-0.57 (0.11)	-0.33 (0.06)	0.32 (0.23)	-0.44 (0.07)	--	--
Dual and not Medicare Managed Care enrolled	1.08 (0.05)	-0.85 (0.06)	-0.11 (0.15)	-0.21 (0.14)	-1.00 (0.11)	-0.87 (0.06)	0.00 (0.23)	-0.82 (0.07)	--	--
Proportion of prior year dual	0.07 (0.05)	-0.07 (0.04)	-0.17 (0.13)	-0.23 (0.09)	0.35 (0.08)	0.07 (0.04)	-0.23 (0.17)	0.17 (0.05)	7.34 (0.99)	0.92 (0.19)
Missing prior year dual	0.43 (0.08)	-0.24 (0.08)	-0.83 (0.39)	-0.11 (0.29)	0.38 (0.19)	-0.09 (0.09)	-1.77 (0.80)	0.10 (0.10)	-2.63 (1.47)	0.25 (0.26)
Dual	-0.11 (0.18)	0.41 (0.15)	-1.71 (0.23)	-0.82 (0.17)	-0.26 (0.22)	-0.33 (0.12)	-0.53 (0.36)	-0.48 (0.13)	--	--
Male	0.22 (0.02)	-0.24 (0.02)	0.15 (0.05)	0.30 (0.04)	-0.28 (0.03)	-0.32 (0.02)	-0.17 (0.07)	-0.47 (0.02)	0.47 (0.43)	0.06 (0.08)
Proportion of prior year Medicare Managed Care enrollment	0.33 (0.03)	-0.44 (0.03)	-0.16 (0.16)	-0.51 (0.07)	0.11 (0.05)	-0.34 (0.03)	-0.46 (0.15)	-0.23 (0.04)	0.22 (1.65)	-0.67 (0.67)
Missing proportion of prior year Medicare Managed Care enrollment	1.22 (0.03)	-1.22 (0.04)	-0.89 (0.14)	-1.07 (0.13)	-0.85 (0.09)	-1.02 (0.04)	-0.24 (0.19)	-0.90 (0.05)	4.35 (1.10)	0.97 (0.45)

Table B.18 *(continued)*

	Nursing facility use	HCBS use	Round-the-clock services use	Day services use	Home-delivered meals use	Home-based services use	Caregiver support services use	Equipment, technology, and modifications use	Inpatient hospital days	Potentially avoidable hospitalizations
Proportion of prior year Medicaid enrolled	-0.93 (0.06)	1.42 (0.07)	0.46 (0.36)	1.41 (0.25)	1.42 (0.14)	1.33 (0.07)	0.45 (0.27)	0.93 (0.08)	1.25 (1.28)	0.19 (0.25)
MLTSS	0.99 (0.06)	0.05 (0.05)	-4.73 (0.71)	-16.97 (0.06)	-19.02 (0.05)	-0.30 (0.05)	-2.06 (0.54)	0.39 (0.05)	2.88 (0.70)	-0.18 (0.18)
MLTSS:dual	-0.80 (0.06)	-0.03 (0.06)	-0.30 (0.81)	1.31 (0.07)	0.62 (0.05)	0.05 (0.06)	0.50 (0.64)	-0.72 (0.06)	--	--
Year 2	0.12 (0.05)	-0.16 (0.04)	-0.12 (0.06)	-0.21 (0.04)	-0.11 (0.05)	-0.07 (0.04)	0.05 (0.09)	-0.05 (0.04)	1.44 (0.46)	0.16 (0.14)
Year 2:dual	-0.21 (0.05)	0.22 (0.04)	0.02 (0.07)	0.28 (0.05)	0.02 (0.05)	0.16 (0.04)	0.02 (0.16)	0.10 (0.04)	--	--
Year 2:MLTSS	-0.06 (0.06)	-0.12 (0.05)	-3.18 (0.71)	9.00 (0.58)	0.10 (0.05)	-0.01 (0.05)	-0.46 (0.65)	-0.03 (0.05)	-1.84 (0.74)	0.13 (0.20)
Year 2:MLTSS:dual	0.17 (0.06)	0.03 (0.05)	1.83 (0.76)	-1.03 (0.84)	-0.06 (0.06)	0.07 (0.05)	0.10 (0.75)	0.03 (0.05)	--	--
Year 3	-0.22 (0.06)	0.18 (0.05)	-0.05 (0.07)	-0.12 (0.06)	-0.16 (0.06)	0.14 (0.05)	0.19 (0.10)	0.09 (0.04)	-0.99 (0.49)	-0.32 (0.15)
Year 3:dual	0.01 (0.07)	-0.04 (0.06)	0.05 (0.09)	0.34 (0.06)	-0.05 (0.06)	-0.02 (0.05)	-0.11 (0.17)	-0.06 (0.05)	--	--
Year 3:MLTSS	0.02 (0.07)	-0.37 (0.06)	-0.62 (1.17)	11.01 (0.23)	9.96 (1.00)	-0.12 (0.06)	2.36 (0.53)	-0.17 (0.06)	-2.35 (0.94)	-0.13 (0.21)
Year 3:MLTSS:dual	0.20 (0.08)	0.19 (0.07)	-3.64 (1.59)	-0.77 (0.28)	-9.88 (1.00)	0.25 (0.07)	0.72 (0.65)	0.16 (0.07)	--	--
Black	-0.36 (0.02)	0.38 (0.02)	-0.23 (0.05)	0.36 (0.04)	0.56 (0.03)	0.36 (0.02)	0.11 (0.07)	0.35 (0.02)	1.12 (0.43)	0.13 (0.08)
Hispanic	-1.61 (0.16)	1.02 (0.16)	-1.09 (0.45)	0.12 (0.30)	0.38 (0.23)	0.96 (0.14)	0.38 (0.36)	0.63 (0.15)	-0.26 (1.45)	0.22 (0.40)
Other race	-1.24 (0.03)	1.05 (0.03)	-0.46 (0.09)	1.03 (0.05)	0.59 (0.05)	0.98 (0.03)	-0.13 (0.09)	0.34 (0.03)	0.42 (0.74)	0.04 (0.11)
Completely rural	0.32 (0.04)	-0.22 (0.04)	-0.25 (0.15)	-0.89 (0.11)	0.44 (0.07)	-0.18 (0.04)	-0.16 (0.14)	0.15 (0.05)	-0.34 (0.71)	0.34 (0.22)

Table B.18 *(continued)*

	Nursing facility use	HCBS use	Round-the-clock services use	Day services use	Home-delivered meals use	Home-based services use	Caregiver support services use	Equipment, technology, and modifications use	Inpatient hospital days	Potentially avoidable hospitalizations
Missing residential area	0.99 (0.11)	-1.84 (0.17)	-5.46 (0.72)	-10.19 (0.20)	-6.50 (1.01)	-1.64 (0.17)	-0.76 (0.67)	-1.86 (0.26)	0.62 (2.23)	-0.60 (0.54)
Mostly rural	0.19 (0.02)	-0.14 (0.02)	-0.13 (0.06)	-0.76 (0.04)	0.45 (0.03)	-0.15 (0.02)	-0.06 (0.08)	0.13 (0.02)	-0.89 (0.62)	0.00 (0.08)
Proportion of prior year study eligible	-0.21 (0.03)	0.15 (0.03)	0.96 (0.17)	1.20 (0.13)	-0.01 (0.05)	-0.06 (0.03)	0.31 (0.15)	0.24 (0.04)	-10.03 (1.06)	-0.97 (0.15)

Notes: Each column in the table corresponds to a different outcome, and each row to a different term in the model. All estimated coefficients are expressed as Estimate (standard error). The colon (:) symbol is used to represent interactions between variables. "--" indicates the term was not included in the model.

Year 1 corresponds to October 2015 to December 2015, Year 2 to January 2016 to December 2016, and Year 3 to January 2017 to December 2017.

CCW = Chronic Conditions Data Warehouse; HCBS = home- and community-based services; MLTSS = managed long-term services and supports; PC = principal component.

Table B.19. Estimated regression coefficients for the models used to evaluate the New Mexico Centennial Care (MLTSS component) program

	Nursing facility use	HCBS use	Round-the-clock services use	Day services use	Home-delivered meals use	Home-based services use	Caregiver support services use	Equipment, technology, and modifications use	Inpatient hospital days	Potentially avoidable hospitalizations
Intercept	-3.82 (0.30)	1.81 (0.09)	-9.98 (0.77)	-5.17 (0.79)	-5.33 (0.50)	1.42 (0.08)	-3.28 (0.15)	-1.36 (0.08)	10.17 (0.64)	-2.80 (0.34)
Age	0.07 (0.01)	0.00 (0.00)	0.09 (0.01)	-0.04 (0.01)	-0.01 (0.01)	0.00 (0.00)	-0.01 (0.00)	0.02 (0.00)	0.00 (0.01)	-0.01 (0.00)
Age:age category	-0.05 (0.01)	-0.02 (0.01)	-0.12 (0.06)	0.03 (NaN)	0.02 (0.01)	-0.02 (0.01)	-0.01 (0.02)	-0.01 (0.01)	-0.05 (0.05)	0.07 (0.02)
Age:age category:dual	0.00 (0.02)	0.00 (0.01)	0.07 (0.06)	-0.03 (NaN)	-0.11 (0.03)	-0.01 (0.01)	0.00 (0.02)	0.01 (0.01)	--	--
Age:dual	0.02 (0.01)	-0.01 (0.00)	-0.03 (0.02)	0.04 (0.02)	0.01 (0.01)	0.00 (0.00)	0.00 (0.00)	-0.01 (0.00)	--	--
Age category	4.12 (1.11)	0.86 (0.94)	7.52 (4.54)	-16.90 (NaN)	-13.84 (0.73)	0.65 (0.96)	0.41 (1.59)	0.47 (0.76)	3.84 (3.67)	-5.80 (1.69)
Age category:dual	-1.58 (1.17)	0.62 (0.96)	-4.58 (4.60)	16.04 (4.56)	19.18 (1.92)	1.22 (0.97)	-0.08 (1.62)	-0.70 (0.77)	--	--
CCW PC 1	-0.06 (0.00)	0.03 (0.00)	-0.02 (0.00)	0.02 (0.01)	0.01 (0.01)	0.04 (0.00)	0.02 (0.00)	-0.01 (0.00)	-0.19 (0.01)	-0.05 (0.00)
CCW PC 2	0.03 (0.00)	-0.03 (0.00)	0.03 (0.00)	0.07 (0.01)	-0.03 (0.01)	-0.02 (0.00)	-0.01 (0.00)	-0.02 (0.00)	-0.08 (0.01)	-0.06 (0.00)
CCW PC 3	-0.07 (0.00)	0.05 (0.00)	-0.03 (0.01)	-0.11 (0.01)	0.03 (0.01)	0.05 (0.00)	0.02 (0.00)	0.02 (0.00)	-0.03 (0.01)	0.02 (0.00)
CCW PC 4	0.06 (0.00)	-0.03 (0.00)	0.01 (0.01)	0.02 (0.02)	-0.01 (0.01)	-0.04 (0.00)	0.00 (0.00)	-0.01 (0.00)	-0.17 (0.02)	-0.04 (0.01)
CCW PC 5	0.00 (0.00)	0.00 (0.00)	0.00 (0.01)	0.08 (0.02)	-0.04 (0.01)	0.01 (0.00)	0.00 (0.00)	-0.01 (0.00)	-0.20 (0.01)	-0.02 (0.00)
CCW PC 6	0.03 (0.00)	-0.01 (0.00)	0.01 (0.01)	0.03 (0.02)	0.00 (0.01)	-0.02 (0.00)	0.00 (0.00)	0.00 (0.00)	0.14 (0.01)	0.03 (0.00)
CCW PC 7	0.01 (0.00)	-0.01 (0.00)	-0.01 (0.01)	0.03 (0.02)	-0.01 (0.01)	-0.01 (0.00)	0.00 (0.00)	-0.02 (0.00)	-0.04 (0.01)	-0.01 (0.01)

Table B.19 *(continued)*

	Nursing facility use	HCBS use	Round-the-clock services use	Day services use	Home-delivered meals use	Home-based services use	Caregiver support services use	Equipment, technology, and modifications use	Inpatient hospital days	Potentially avoidable hospitalizations
CCW PC 8	0.00 (0.00)	0.01 (0.00)	-0.03 (0.01)	0.03 (0.02)	0.01 (0.01)	0.01 (0.00)	0.01 (0.00)	0.00 (0.00)	-0.09 (0.02)	-0.01 (0.00)
CCW PC 9	0.00 (0.00)	-0.01 (0.00)	-0.02 (0.01)	0.01 (0.02)	0.01 (0.01)	0.00 (0.00)	0.00 (0.00)	-0.01 (0.00)	0.01 (0.01)	0.01 (0.01)
CCW PC 10	0.03 (0.00)	-0.02 (0.00)	0.01 (0.01)	-0.04 (0.02)	-0.02 (0.01)	-0.02 (0.00)	0.00 (0.00)	0.00 (0.00)	0.09 (0.02)	0.04 (0.01)
Missing CCW indicator	-1.58 (0.09)	0.57 (0.08)	0.89 (0.22)	0.75 (0.69)	-0.47 (0.55)	0.83 (0.08)	0.46 (0.19)	-1.17 (0.10)	-6.82 (0.35)	-3.14 (0.59)
Dual and Medicare Managed Care enrolled	-0.92 (0.43)	0.56 (0.14)	2.40 (0.98)	0.18 (0.93)	-2.30 (0.86)	0.84 (0.14)	0.22 (0.24)	-0.16 (0.13)	--	--
Dual and Missing Medicare Managed Care enrolled	0.28 (0.43)	-1.79 (0.13)	2.19 (0.97)	-1.84 (0.95)	-1.54 (0.88)	-1.77 (0.13)	-0.58 (0.25)	-0.70 (0.13)	--	--
Dual and not Medicare Managed Care enrolled	-1.20 (0.43)	-0.77 (0.13)	1.68 (0.97)	-1.55 (0.99)	-1.28 (0.82)	-0.63 (0.13)	-0.25 (0.24)	-0.71 (0.13)	--	--
Proportion of prior year dual	-0.24 (0.06)	0.72 (0.05)	0.16 (0.20)	-0.40 (0.51)	0.99 (0.49)	0.70 (0.05)	0.16 (0.11)	0.01 (0.05)	-2.28 (1.37)	-115.18 (4.37)
Male	0.39 (0.04)	-0.24 (0.02)	0.19 (0.10)	0.34 (0.24)	-0.02 (0.20)	-0.22 (0.02)	-0.12 (0.04)	-0.26 (0.02)	0.75 (0.14)	-0.04 (0.07)
Proportion of prior year Medicare/Medicaid enrollment	-0.84 (0.04)	-1.53 (0.03)	-0.28 (0.09)	-0.82 (0.20)	-0.06 (0.22)	-1.69 (0.03)	-0.60 (0.04)	-0.24 (0.02)	-0.35 (0.24)	-0.01 (0.12)
Proportion of prior year Medicaid enrolled	-1.17 (0.13)	-0.73 (0.07)	-0.56 (0.54)	-1.96 (0.99)	0.10 (0.47)	-0.83 (0.07)	-0.56 (0.15)	0.17 (0.06)	-1.31 (0.46)	-0.51 (0.32)
Year 2	-0.82 (0.04)	-0.75 (0.03)	-0.24 (0.12)	0.10 (0.23)	-0.57 (0.21)	-0.79 (0.03)	-0.08 (0.04)	-0.28 (0.02)	-1.84 (0.24)	-1.21 (0.10)

Table B.19 *(continued)*

	Nursing facility use	HCBS use	Round-the-clock services use	Day services use	Home-delivered meals use	Home-based services use	Caregiver support services use	Equipment, technology, and modifications use	Inpatient hospital days	Potentially avoidable hospitalizations
Year 2: dual	0.48 (0.04)	0.12 (0.03)	0.06 (0.13)	0.18 (0.27)	0.65 (0.25)	0.14 (0.03)	-0.03 (0.05)	0.22 (0.02)	--	--
Year 3	-0.86 (0.05)	-1.03 (0.03)	-0.34 (0.15)	0.37 (0.27)	-0.27 (0.22)	-1.05 (0.03)	-0.01 (0.04)	-0.23 (0.02)	-2.00 (0.25)	-1.25 (0.11)
Year 3: dual	0.48 (0.05)	0.32 (0.04)	0.11 (0.16)	0.06 (0.31)	0.17 (0.27)	0.31 (0.03)	0.10 (0.06)	0.38 (0.03)	--	--
Year 4	-0.95 (0.06)	-1.27 (0.03)	-0.21 (0.16)	0.41 (0.29)	-0.81 (0.23)	-1.31 (0.03)	-0.09 (0.05)	-0.16 (0.02)	-2.25 (0.25)	-1.41 (0.11)
Year 4: dual	0.43 (0.06)	0.44 (0.04)	0.10 (0.17)	-0.05 (0.34)	0.54 (0.31)	0.50 (0.04)	0.23 (0.07)	0.32 (0.03)	--	--
Black	-0.34 (0.12)	0.05 (0.06)	-0.81 (0.35)	0.37 (0.61)	-0.79 (0.38)	0.11 (0.06)	0.16 (0.13)	-0.15 (0.05)	-0.01 (0.33)	0.29 (0.17)
Hispanic	-0.39 (0.04)	0.21 (0.02)	-0.66 (0.11)	0.06 (0.25)	-0.67 (0.17)	0.27 (0.02)	0.17 (0.04)	-0.06 (0.02)	-0.20 (0.15)	-0.03 (0.09)
Other race	-0.62 (0.05)	0.32 (0.03)	-0.84 (0.14)	-0.15 (0.35)	-0.63 (0.27)	0.44 (0.03)	0.16 (0.05)	-0.63 (0.03)	-0.05 (0.19)	0.01 (0.10)
Completely rural	0.05 (0.14)	0.01 (0.08)	-1.06 (0.48)	-0.61 (1.03)	-0.14 (0.33)	0.07 (0.08)	-0.34 (0.19)	0.04 (0.07)	-0.60 (0.39)	-0.07 (0.25)
Mostly rural	-0.08 (0.05)	-0.04 (0.03)	0.14 (0.15)	-15.80 (0.18)	-0.15 (0.21)	-0.04 (0.03)	-0.65 (0.07)	-0.14 (0.03)	-0.38 (0.18)	0.15 (0.11)
Proportion of prior year study eligible	0.09 (0.13)	1.09 (0.06)	0.91 (0.52)	1.74 (0.97)	-0.60 (0.39)	1.18 (0.06)	0.26 (0.15)	0.19 (0.06)	-0.43 (0.40)	-0.24 (0.27)

Notes: Each column in the table corresponds to a different outcome, and each row to a different term in the model. All estimated coefficients are expressed as Estimate (standard error). The colon (:) symbol is used to represent interactions between variables. "--" indicates the term was not included in the model.

Year 1 corresponds to January 2014 to December 2014, Year 2 to January 2015 to December 2015, Year 3 to January 2016 to December 2016, and Year 4 to January 2017 to December 2017.

CCW = Chronic Conditions Data Warehouse; HCBS = home- and community-based services; MLTSS = managed long-term services and supports; PC = principal component.

Table B.20. Estimated regression coefficients for the models used to evaluate the New York MAP program

	Nursing facility use	HCBS use	Round-the-clock services use	Day services use	Home-delivered meals use	Home-based services use	Caregiver support services use	Equipment, technology, and modifications use
Intercept	-3.86 (1.13)	-1.02 (0.51)	-26.57 (0.25)	-4.06 (1.12)	-2.86 (1.15)	-1.12 (0.46)	-26.57 (0.25)	-1.11 (0.38)
Age	0.04 (0.02)	0.00 (0.01)	0.00 (0.00)	0.01 (0.01)	0.00 (0.01)	-0.01 (0.01)	0.00 (0.00)	0.01 (0.01)
Age:age category	-0.03 (0.02)	0.00 (0.01)	0.00 (0.00)	-0.09 (0.01)	-0.04 (0.02)	0.00 (0.01)	0.00 (0.00)	0.00 (0.01)
Age category	1.38 (1.09)	0.07 (0.49)	0.00 (0.22)	6.16 (0.89)	2.53 (1.04)	0.13 (0.43)	0.00 (0.22)	0.13 (0.33)
CCW PC 1	0.03 (0.00)	-0.01 (0.00)	0.00 (0.00)	0.00 (0.00)	0.01 (0.00)	-0.01 (0.00)	0.00 (0.00)	0.00 (0.00)
CCW PC 2	0.01 (0.00)	-0.02 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-0.01 (0.00)	0.00 (0.00)	-0.01 (0.00)
CCW PC 3	0.03 (0.00)	-0.02 (0.00)	0.00 (0.00)	-0.03 (0.00)	-0.04 (0.01)	-0.02 (0.00)	0.00 (0.00)	-0.01 (0.00)
CCW PC 4	0.01 (0.00)	0.00 (0.00)	0.00 (0.00)	0.01 (0.00)	0.00 (0.01)	-0.01 (0.00)	0.00 (0.00)	0.00 (0.00)
CCW PC 5	0.00 (0.00)	-0.01 (0.00)	0.00 (0.00)	-0.02 (0.01)	-0.01 (0.01)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
CCW PC 6	-0.03 (0.00)	0.02 (0.00)	0.00 (0.00)	0.01 (0.00)	0.02 (0.01)	0.01 (0.00)	0.00 (0.00)	0.01 (0.00)
CCW PC 7	0.02 (0.00)	-0.01 (0.00)	0.00 (0.00)	0.00 (0.01)	-0.01 (0.01)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
CCW PC 8	0.02 (0.00)	0.01 (0.00)	0.00 (0.00)	0.01 (0.01)	-0.03 (0.01)	-0.01 (0.00)	0.00 (0.00)	0.00 (0.00)
CCW PC 9	-0.01 (0.01)	0.00 (0.00)	0.00 (0.00)	0.00 (0.01)	0.01 (0.01)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)

Table B.20 *(continued)*

	Nursing facility use	HCBS use	Round-the-clock services use	Day services use	Home-delivered meals use	Home-based services use	Caregiver support services use	Equipment, technology, and modifications use
CCW PC 10	0.00 (0.01)	0.00 (0.00)	0.00 (0.00)	0.00 (0.01)	0.01 (0.01)	0.01 (0.00)	0.00 (0.00)	0.01 (0.00)
Male	0.29 (0.08)	-0.25 (0.05)	0.00 (0.02)	0.21 (0.09)	0.37 (0.13)	-0.22 (0.04)	0.00 (0.02)	-0.41 (0.03)
Medicare Managed Care enrolled in prior year	0.16 (0.15)	-0.18 (0.11)	0.00 (0.04)	0.18 (0.18)	-0.84 (0.19)	-0.40 (0.10)	0.00 (0.04)	-0.15 (0.07)
Medicare Managed Care enrolled	-1.13 (0.14)	0.83 (0.11)	0.00 (0.04)	0.41 (0.18)	0.58 (0.19)	1.27 (0.10)	0.00 (0.04)	0.33 (0.07)
Proportion of prior year Medicaid enrolled	-1.30 (0.49)	1.86 (0.28)	0.00 (0.15)	0.00 (0.84)	-0.75 (0.82)	1.32 (0.26)	0.00 (0.15)	0.06 (0.24)
Year 2	-0.39 (0.07)	0.15 (0.04)	0.00 (0.02)	-0.12 (0.06)	0.15 (0.10)	0.19 (0.03)	0.00 (0.02)	0.00 (0.03)
Year 3	-0.08 (0.06)	0.08 (0.04)	0.00 (0.01)	-0.46 (0.05)	0.06 (0.10)	0.15 (0.03)	0.00 (0.01)	-0.03 (0.02)
Black	-0.32 (0.10)	0.33 (0.07)	0.00 (0.03)	0.50 (0.19)	0.13 (0.20)	0.54 (0.06)	0.00 (0.03)	0.17 (0.05)
Hispanic	-1.11 (0.10)	0.50 (0.07)	0.00 (0.03)	0.70 (0.18)	-0.05 (0.19)	0.92 (0.06)	0.00 (0.03)	0.03 (0.05)
Other race	-0.83 (0.15)	0.48 (0.10)	0.00 (0.04)	1.08 (0.20)	-0.70 (0.32)	0.41 (0.08)	0.00 (0.04)	-0.20 (0.06)
Proportion of prior year study eligible	1.43 (0.12)	-0.30 (0.05)	0.00 (0.02)	0.04 (0.09)	0.50 (0.14)	-0.95 (0.04)	0.00 (0.02)	0.72 (0.03)

Notes: Each column in the table corresponds to a different outcome, and each row to a different term in the model. All estimated coefficients are expressed as Estimate (standard error). The colon (:) symbol is used to represent interactions between variables. "--" indicates the term was not included in the model.

Year 1 corresponds to July 2015 to December 2015, Year 2 to January 2016 to December 2016, and Year 3 to January 2017 to December 2017.

CCW = Chronic Conditions Data Warehouse; HCBS = home- and community-based services; MLTSS = managed long-term services and supports; PC = principal component.

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Appendix C:
Data and methods used to evaluate beneficiary experience of care and quality of life

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A. Overview

As described in Section IV, this study compared MLTSS and FFS programs on self-reported access to care, experience of care, and quality of life in the NCI-AD survey. This appendix describes our approach in more detail. It begins by presenting the size and demographic characteristics of the sample. It then identifies the survey items included in the analysis, as well as the responses considered in the model. Next, it presents our modeling approach. Finally, it concludes with detailed tables of findings, shown in graphical form in Section IV.

B. Descriptive characteristics of the sample

The analysis of access, experience of care, and quality of life combines data on MLTSS programs in 7 states and FFS programs in 14 states as reported in three NCI-AD survey waves: (1) 2015–2016, (2) 2016–2017, and (3) 2017–2018. Table C.1 identifies the states and programs included in the FFS and MLTSS samples, and the total sample size for each state, program, and year. Delaware, Minnesota, New Jersey, and Wisconsin surveyed respondents in relevant MLTSS and FFS programs, so we included respondents from each of those programs in our groups of MLTSS and FFS samples. Though the exact number of respondents, as well as the states and programs in which they are enrolled varied each year, the total sample across all years includes 29,257 respondents, 11,915 (39 percent) of whom were enrolled in MLTSS programs.

Table C.1. Sample size among MLTSS and FFS programs, by survey wave

State	Programs included in sample	2015–2016	2016–2017	2017–2018
All states		**9,029**	**6,860**	**12,737**
MLTSS programs		**3,780**	**2,297**	**5,838**
Delaware	Division of Medicaid and Medical Assistance (DMMA) ('15–'16 only), Home and Community-based Services (HCBS) — Managed Care Organizations (MCOs) A & B ('17–'18 only); Skilled Nursing Facility (SNF) – MCOs A & B ('17–'18 only)	314	-	675
Kansas	Frail Elderly (FE) waiver; Physical Disabilities (PD) waiver; Traumatic Brain Injury (TBI) waiver	200	209	207
Minnesota	Elderly waiver ('15–'16 and '17–'18 only)	56	-	1,452
New Jersey	All Managed Long-Term Services and Supports (MLTSS) and MLTSS/HCBS plans ('15–'16 and '16–'17 only)	830	1,236	-
Tennessee	Sample average	923	852	858
Texas	All STAR+PLUS managed care plans ('15–'16 and '17–'18 only)	1,457	-	1,485
Wisconsin	Family Care, Frail Elderly (FE), and Physically Disabled (PD) ('17–'18 only); Partnership Frail Elderly (FE) & Physically Disabled (PD) ('17–'18 only)	-	-	1,161
FFS Programs		**5,249**	**4,563**	**6,899**
Colorado	Brain Injury (BI) waiver ('15–'16 only); Colorado Choice Transitions (CCT) ('17–'18 only); Elderly, Blind, and Disabled (EBD) waiver; Frail Elderly – Accountable Care Collaborative (ACC): Medicare-Medicaid Program (MMP) ('15–'16 and '16–'17 only)	316	316	806

Table C.1 *(continued)*

State	Programs included in sample	2015–2016	2016–2017	2017–2018
Delaware	Division of Services for Aging and Adults with Physical Disabilities (DSAAPD) ('15–'16 only)	92	-	-
Georgia	Community Care Services Program (CCSP) (waiver) ('15–'16 only)	331	-	-
Indiana	Aged and Disabled waiver ('15–'16 and '16–'17 only); Traumatic Brain Injury waiver ('15–'16 and '16–'17 only); Medicaid Nursing Facility (NF) ('15–'16 only); Medicaid SNF ('16–'17 only); Medicaid waiver ('17–'18)	493	708	699
Maine	Elder and Adults with Disabilities waiver ('15–'16 and '16–'17 only); Adult Private Duty Nursing/Personal Care ('16–'17 only); Adult Family Home Care ('15–'16 only); Brain Injury Services ('16–'17 only); Consumer Directed Attendant ('15–'16 only); Day Health ('15–'16 only); MaineCare Day Health Services ('16–'17); Private Non-Medical Institutions (PNMI) Residential Care Appendix C; Private Duty Nursing ('15–'16);	437	351	-
Minnesota	Alternative Care (AC) ('15–'16 and '17–'18 only), disability subsample ('15–'16 and '17–'18 only); all sampled populations ('16'–17' only)	2,285	403	1,986
Mississippi	Assisted living waiver ('15–'16 and '16–'17 only); Elderly and Disabled waiver ('15–'16 and '16–'17 only); Independent Living waiver ('15–'16 and '16–'17 only)' TBI/Spinal Injury waiver ('15–'16 and '16–'17 only)	935	965	-
Nebraska	Aged and Disabled (A&D) waiver ('17–'18 only); Nursing Facility services (NFs) ('17–'18 only); Personal Assistance Services (PAS) ('17–'18 only); TBI waiver ('17–'18 only);	-	-	672
New Jersey	SNF ('15–'16 only)	104	-	-
Nevada	Frail Elderly (FE) waiver ('16–'17 and '17–'18 only); Persons with Physical Disabilities (PD) waiver ('16–'17 and '17–'18 only)		385	406
Ohio	Assisted Living waiver; Ohio Home Care waiver ('16–'17 only); PASSPORT waiver	256	918	474
Oregon	Adult Foster Homes ('16–'17 and '17–'18 only); Assisted Living Facilities ('16–'17 and '17–'18 only); In-home ('16–'17 and '17–'18 only); Nursing Facilities ('16–'17 and '17–'18 only); Residential Care Facilities ('16–'17 and '17–'18 only)	-	517	511
Vermont	All Choices for Care (CFC) ('17–'18 only); TBI program ('17–'18 only)	-	-	428
Wisconsin	Fee-for-Service (FFS) nursing homes ('17–'18 only); Include, Respect, I-Self Direct Program (IRIS) ('17–'18 only)	-	-	917

"-" Indicates that there were no data reported for the FFS or MLTSS programs during the survey wave.

FFS = fee-for-service; MLTSS = managed long-term services and supports.

The demographic characteristics of survey respondents in the MLTSS group generally were similar to those in the FFS group; however, there were some notable differences between the groups and across time (Table C.2). For example, the average age in the MLTSS group was higher than the average age of the FFS group every year, and the average age also varied more from year to year for the FFS group. In the 2015–2016 survey wave, the MLTSS and FFS groups had a similar proportion of female respondents (68.9 and 66.7 percent, respectively), but over time, the FFS sample became increasingly male. In contrast, the MLTSS sample did not change to the same degree. For ethnicity and language, across the three survey waves, the FFS group had a greater proportion of White respondents than the MLTSS group (72.0 percent compared to 63.5 percent), as well as more English speakers (95.8 percent compared to 87.6 percent). The proportion of White respondents increased over time in both MLTSS and FFS groups.

Regarding living arrangements, both groups had more respondents living with someone rather than alone, as well as more respondents living in metropolitan areas than other areas in all survey waves. Comparing the two groups, in all years there were more respondents living alone in the MLTSS group than the FFS group (39.3 percent versus 35.6 percent); however, the decline over time in the percentage living alone was greater in the FFS group than in the MLTSS group (a 13 percent decline for FFS compared to 6 percent for MLTSS). There were also more metropolitan residents in the MLTSS group compared to the FFS group (an average proportion of 73.8 percent compared to 62.4 percent), though the difference between the groups narrowed over time. In addition, the majority of respondents resided in their own homes, though the proportion of people in their own home was greater in the MLTSS group than the FFS group (three-year average of 71.9 percent in the MLTSS group compared to 64.6 percent in the MLTSS group).

Table C.2. Demographic characteristics of the NCI-AD sample

	2015–2016		2016–2017		2017–2018		3-year average	
	MLTSS	FFS	MLTSS	FFS	MLTSS	FFS	MLTSS	FFS
Age								
Average age (N)	67.2 (SD = 6.3)	64.7 (SD = 7.2)	66.5 (SD = 2.7)	63.9 (SD = 6.9)	66.6 (SD = 5.6)	65.1 (SD = 7.1)	66.8 (SD = 5.1)	64.6 (SD = 6.8)
Proportion age 90+ (%)	10.0 (SD = 5.2)	8.1 (SD = 5.0)	10.8 (SD = 4.5)	7.6 (SD = 5.1)	9.5 (SD = 3.6)	8.0 (SD = 3.3)	10.0 (SD = 4.2)	7.9 (SD = 4.3)
Gender								
Female (%)	68.9	66.7	64.4	64.7	67.0	63.7	67.3	65.0
Male (%)	31.1	33.3	35.6	35.3	33.0	36.1	32.7	34.9
Race and ethnicity								
White (%)	61.2	67.6	64.8	71.1	65.1	77.0	63.5	72.0
Non-White[a] (%)	38.8	32.4	35.2	28.9	34.9	23.0	36.5	28.0
Primary language								
English (%)	85.8	96.3	88.8	96.5	88.7	94.7	87.6	95.8
Spanish (%)	10.1	1.1	6.2	0.9	8.7	1.1	8.8	1.1
Other (%)	4.0	2.6	5.1	2.6	2.6	4.2	3.7	3.1

Table C.2 *(continued)*

	2015–2016		2016–2017		2017–2018		3-year average	
	MLTSS	**FFS**	**MLTSS**	**FFS**	**MLTSS**	**FFS**	**MLTSS**	**FFS**
Who the person lives with								
Alone (%)	40.4	38.4	39.4	34.9	38.1	33.3	39.3	35.6
Not alone[b] (%)	59.6	61.6	60.6	65.1	61.9	66.7	60.7	34.4
Type of residence								
Own home[c] (%)	78.6	68.7	63.5	61.2	69.5	63.5	71.9	64.6
Nursing facility/home (%)	7.1	13.2	19.5	8.1	16.7	15.2	13.4	12.3
Other[d] (%)	14.2	18.2	17.0	30.7	13.9	21.4	14.6	23.1
Type of residential area								
Metropolitan (%)	76.6	60.5	74.8	63.1	70.4	63.6	73.8	62.4
Other[e] (%)	23.4	39.5	25.2	36.9	29.6	36.4	26.2	37.6

FFS = fee-for-service; MLTSS = managed long-term services and supports; SD = standard deviation.

[a] "Nonwhite" includes American Indian or Alaska Native, Asian, Black or African-American, Pacific Islander, Hispanic or Latino, or other.

[b] "Not alone" includes spouse or partner, other family, friend(s), live-in personal care attendant (PCA), or other (not family, friend, or PCA).

[c] "Own home" includes family house or apartment and senior living apartment or complex.

[d] "Other" includes group home, adult family home, foster, host home, assisted living or residential care facility, temporary shelter, or none (i.e., homeless).

[e] "Other" includes micropolitan, rural, or small town.

C. Survey items included in the analysis

The cross-state analysis of experience of care and quality of life uses 33 survey items from the NCI-AD survey conducted in each of three survey waves. We selected these survey items from the 106 total survey items included in the 2015–2016 survey wave because they correspond closely to the three beneficiary outcomes that this evaluation examines (access, experience of care, and quality of life) and do not duplicate other measures used in this evaluation. The NCI-AD survey also asked about these items and reported their responses in a similar way across all three survey waves, allowing the possibility of combining data across years. Representatives from ADvancing States and HSRI (the organizations responsible for developing and analyzing the survey across states) indicated that the survey items we selected are among the most important items for state monitoring and quality improvement efforts.

For each survey item, we used program-level response data and adjusted the data to fit our model specifications. We abstracted the data for Medicaid-funded MLTSS or FFS programs (1915(c) waivers and nursing facilities) from the reports that NASUAD and HSRI produce for each state and survey wave (Table C.1). We adjusted the responses for each item so that all responses were mutually exclusive, generally following the collapsing rules that HSRI specified in its national reports for each survey wave. We also reworded survey questions and coded responses for positive directionality. A list of survey items and their most favorable responses are shown in Table C.3.

Table C.3. List of NCI-AD survey items, domains, and associated responses

Unique ID	Survey item[a]	Response categories
Access		
ACCESS_1A	People who have transportation when they want to do things outside of their home	1 = No 2 = Sometimes 3 = Yes
ACCESS_1B	People who have transportation to get to medical appointments when they need to	1 = No 2 = Sometimes 3 = Yes
ACCESS_2A	People who have grab bars in the bathroom or elsewhere in home (and do not need an upgrade)	1 = Needs one 2 = Has one, but needs upgrade 3 = Has one, and doesn't need upgrade
ACCESS_2C	People who have a specialized bed (and do not need an upgrade)	1 = Needs one 2 = Has one, but needs upgrade 3 = Has one, and doesn't need upgrade
ACCESS_2D	People who have a ramp or stair lift in or outside the home (and do not need an upgrade)	1 = Needs one 2 = Has one, but needs upgrade 3 = Has one, and doesn't need upgrade
ACCESS_2H	People who have a walker (and do not need an upgrade)	1 = Needs one 2 = Has one, but needs upgrade 3 = Has one, and doesn't need upgrade
ACCESS_2K	People who have a wheelchair (and do not need an upgrade)	1 = Needs one 2 = Has one, but needs upgrade 3 = Has one, and doesn't need upgrade
Care coordination		
CCOORD_1A	People who reported feeling comfortable and supported enough to go home after being discharged from a hospital or rehabilitation facility (if occurred in the past year)	1 = No 2 = In-between 3 = Yes
CCOORD_2A	People who reported someone followed up with them after discharge from a hospital or rehabilitation facility (if occurred in the past year)	1 = No 2 = Yes
Control		
CONTRL_1A	People who feel in control of their life	1 = No 2 = In-between 3 = Yes
Everyday living		
EVDYLV_1C	People who always get enough assistance with everyday activities when they need it (if need any assistance)	1 = No 2 = Yes
EVDYLV_1D	People who always get enough assistance with self-care when they need it	1 = No 2 = Yes

Table C.3 *(continued)*

Unique ID	Survey item[a]	Response categories
Health care		
HLTHCR_2A	People who have had a physical exam or wellness visit in the past year	1 = No 2 = Yes
HLTHCR_2B	People who have had a hearing exam in the past year	1 = No 2 = Yes
HLTHCR_2C	People who have had a vision exam in the past year	1 = No 2 = Yes
HLTHCR_2D	People who have had a flu shot in the past year	1 = No 2 = Yes
HLTHCR_2E	People who have had a routine dental visit in the past year	1 = No 2 = Yes
HLTHCR_2F	People who have had a cholesterol screening done by a doctor or nurse in the past five years	1 = No 2 = Yes
HLTHCR_3B	People who can always get an appointment to see their primary care doctor when they need to	1 = Does not have a primary care doctor/no, rarely/ sometimes or rarely 2 = Usually 3 = Yes, always
HLTHCR_4A	People who have talked to someone about feeling sad and depressed during the past 12 months (if feeling sad and depressed)	1 = No 2 = Yes (i.e., friend, family member, doctor or nurse, or unspecified)
Rights and respect		
RGTRSP_2A	People who feel that their paid support staff treat them with respect	1 = No, never or rarely 2 = Some, or usually 3 = Yes, all paid support workers, always or almost always
Relationships		
RLTSHP_1A	People who can always or almost always see or talk to friends and family when they want (if there are friends and family who do not live with person)	1 = No, or only sometimes 2 = Always or almost always (i.e., most of the time, usually, or some family and/or friends; yes, always; chooses not to)
Safety		
SAFETY_1A	People who feel safe at home always or more of the time	1 = Rarely or never 2 = Always or most of the time
SAFETY_2A	People who always feel safe around their paid support staff	1 = No or not always 2 = Yes, all paid support workers, always
SAFETY_5A	People who are able to get to safety quickly in case of an emergency like a fire or a natural disaster	1 = No 2 = Yes

Table C.3 *(continued)*

Unique ID	Survey item[a]	Response categories
Satisfaction		
STSFCN_1A	People who like where they are living	1 = No 2 = In-between, most of the time 3 = Yes
STSFCN_2A	People who like how they usually spend their time during the day	1 = No, never 2 = Always or sometimes (i.e., some days, sometimes; always, or almost always)
STSFCN_3A	People whose paid support staff do not change too often	1 = Yes; 2 = Some or sometimes 3 = No (i.e., no, or paid support person(s) are live-in)*
STSFCN_3B	People whose paid support staff do things the way they want them done always or almost always	1 = No, never or rarely 2 = Some, or usually 3 = Yes, all paid support workers, always or almost always
Service coordination		
SVCCDN_2A	People whose case manager/care coordinator talked to them about services that might help with unmet needs and goals (if have case manager and have unmet needs and goals)	1 = No 2 = Yes
SVCCDN_3A	People who always can reach their case manager/care coordinator when they need to (if know they have case manager/care coordinator)	1 = No 2 = Most of the time, usually 3 = Yes
SVCCDN_4A	People whose services meet all their needs and goals	1 = No, not at all, needs or goals are not met 2 = Mostly, most or some needs and goals 3 = Yes, completely, all needs and goals
SVCCDN_8A	People whose paid support staff show up and leave when they are supposed to	1 = No, never or rarely 2 = Some, or usually 3 = Yes, all paid support workers, always or almost always

[a] Survey items have been reworded from their original form to reflect the recoding and collapsing required of the model. Measures presented in the model were calculated as proportions for each item response category.

D. Statistical model

1. Motivation

The goal of this analysis is to compare the responses on the NCI-AD survey between MLTSS and FFS beneficiaries and estimate the impact of MLTSS participation on those responses. Each survey item included in the analysis contains either two or three levels (Table C.3), which are naturally ordered from least to most favorable. We fit a Bayesian hierarchical ordinal logistic regression model to conduct these comparisons. The model accounts for the fact that a beneficiary answered multiple survey questions and beneficiaries are clustered within programs. The model also adjusted for differences between MLTSS and FFS beneficiaries in observed demographic and state-level characteristics. We used ordinal logistic regression to treat response options as ordinal categories, preserving their natural order and scale in the responses without assuming a linear progression from one to the next. The approach models all survey items simultaneously in a single model, borrowing strength across survey items and modeling the correlation between their associated parameters.

We believe this method is superior to using simpler regression models, such as ordinary least squares or logistic regression, which have the potential to produce biased estimates. When more than two levels exist for a particular survey item, traditionally the data are analyzed either by assuming that the ordinal responses are continuous (so the difference between a "1" and a "2" is the same as the difference between a "2" and a "3") or by dichotomizing the response options. The former approach has been shown to produce biased estimates (Bürkner 2019), whereas the latter approach has the potential for missing important differences not observed in the dichotomized version of the outcome.

In addition, a more traditional "frequentist" approach would fit a separate model to each of the 33 survey items to estimate each impact. This approach can lead to inflated Type I errors and exaggerated estimates due to the well-known "multiple comparisons problem." Common corrections for this issue, such as the Bonferroni or Benjamini-Hochberg corrections, are known to be overly conservative because they do not model the correlation between different outcomes and may be less applicable in the social sciences. Our hierarchical model includes a prior specification for these parameters that provides an implicit multiple comparisons correction, thus eliminating the need for more conservative post hoc procedures (Gelman et al. 2012).

2. Hierarchical ordinal logistic regression

Let i index the LTSS program (in one of the 7 MLTSS or 14 FFS states), t index the survey report year (2015–16, 2016–17, or 2017–18), j index the NCI-AD survey item (of the 33 items in Table C.3), and k index the response option. For any survey item j, k can range from 1 (lowest response) to K_j (indicating the highest response— $K_j = 2$ or 3 in this survey). Also, let l index the survey respondent (beneficiary), with n_{jt} being the total number of respondents to

survey item j at time t. We fit the following hierarchical ordinal logistic regression model to the data:

$$\log\left(\frac{p_{ikt}^{j}(x)}{1-p_{ikt}^{j}(x)}\right) = \alpha_{jk} + a_i + X_{it}\beta_j + \delta_{jt} + \theta_{jt}MLTSS_i$$

where $p_{itk}^{j}(x) = Prob\left(Y_{lit}^{j} > k | X_{it} = x\right)$, $j \in \{1,\ldots 33\}$, $k \in \{1,\ldots,K_j - 1\}$, $t \in \{1,2,3\}$, and $l \in \{1,\ldots n_{jt}\}$. Here, Y_{lit}^{j} is the ordinal response of beneficiary l to survey question j at time t from program i. We note that because we do not include any beneficiary-level covariates, $p_{itk}^{j}(x)$ is the same for all beneficiaries from program i. In addition, X_{it} are state- and program-level features for program i at time t, and $MLTSS_i$ is an indicator that program i is an MLTSS program (as opposed to FFS). For any given j, k, and t, the left-hand-side of the regression equation is known as the log odds that Y_{lit}^{j} is greater than k for any beneficiary l from program i. Thus, the model expresses the log odds that outcome j is above a given threshold k as a linear function of the covariates.

For any given outcome j, the model consists of either one or two regression equations, depending on whether K_j is equal to 2 or 3. For outcomes for which $K_j = 2$ (that is, the outcome only has two response options), the regression simply reduces to a logistic regression model that predicts the probability that the outcome has a value of 2. On the other hand, if $K_j = 3$, the model consists of two logistic regression equations: one for $k = 1$ and one for $k = 2$. The model for $k = 1$ compares the probability of responding with Option 2 or 3 to the probability of responding with Option 1, whereas the model for $k = 2$ compares the probability of responding with Option 3 to the probability of responding with Option 1 or 2. Importantly, the only parameters that differ between the two models are the intercepts, α_{jk}. All other parameters are assumed to be the same across the two models.

The key parameters in this model are the MLTSS coefficients θ_{jt}. These parameters estimate the difference in the log odds of a response to question j above each threshold k between MLTSS and FFS respondents, separately for each year (t), holding all other covariates constant. A difference in log odds is more commonly called a log odds ratio; our results present impacts as odds ratios, where $OR_{jt} = e^{\theta_{jt}}$. For outcomes that have $K_j = 3$, we note that the same MLTSS effect is assumed when modeling the log odds that $Y_{lit}^{j} > 1$ as when modeling the log odds that $Y_{lit}^{j} > 2$, meaning we assume MLTSS participation multiplies the odds by the same amount when comparing Response Option 1 to Response Options 2 and 3 as it does when comparing Response Options 1 and 2 to Response Option 3. This assumption is known as the *proportional odds*

assumption. For this reason, we say that the MLTSS impact estimate, OR_{jt}, is the odds ratio of a *more favorable response*, comparing MLTSS to FFS. That is, this value is the odds of a more favorable response for MLTSS beneficiaries divided by the odds of a more favorable response for FFS beneficiaries.

The model is *hierarchical*, in that we allow our estimates of MLTSS effects and other parameters in the model to vary across survey questions and time, as indicated by the subscripts on the δ_{jt} and θ_{jt} parameters, as well as the threshold parameters α_{jk}. We also allow the effects of covariates (β_j) to vary by outcome. Covariates included in this model include (1) program-specific demographic characteristics presented in Table C.2, plus (2) the following state-level characteristics: percentage of LTSS spending for HCBS, number of home health or personal care aides per 100 people age 18+ with limitations on ADLs, and number of nursing facility beds per 100 people age 18+ with limitations on ADLs. Finally, we include program-specific random intercepts (a_i) to account for within-program correlation.

3.   Bayesian specification

We fit the model using Stan, a state-of-the-art probabilistic programming language designed to fit Bayesian models (Carpenter et al. 2017). To complete our Bayesian specification, we placed prior distributions on all regression parameters. Our choice of priors was informed by current best practices in the field of Bayesian analysis (Stan Development Team 2018), as well as subject matter knowledge and context. These priors promote borrowing of strength across survey items, domains, and years. Thus, if we observe a risk-adjusted difference between MLTSS and FFS for a particular survey item and year that is either much larger or smaller than the differences for similar survey items, the estimate for that item will be "shrunken" toward the estimates of the other items, to the extent the model deems this shrinkage to be appropriate. Full details on our prior specifications are available upon request.

4.   Presentation of impacts

The parameters θ_{jt} in the model are log odds ratios for the impact of MLTSS, which can be exponentiated to produce odds ratios. We also produce 95 percent credible intervals[51] for each impact. This interval is identified by the 2.5th and 97.5th quantiles of the posterior distribution for the odds ratio. For each impact estimate, we also calculate the Bayesian posterior probability that the odds ratio is greater than 1 by simply determining the proportion of the posterior density of the odds ratio that is greater than 1. We interpret the posterior probability as the probability that MLTSS participation improves the odds of responding favorably on a particular survey item.

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[51] A 95% credible is the Bayesian analog to a 95% confidence interval, with a slightly different interpretation. It is an interval such that the probability that the true odds ratio falls within the interval is 95 percent.

E. Results

The following table presents the odds of MLTSS enrollees responding favorably to NCI-AD domains and individual survey items compared to FFS beneficiaries; graphs of these results are presented in Section IV. It also includes 95 percent credible intervals and posterior probabilities (that is, the probability that MLTSS participation improves one's odds of responding favorably). These values provide the reader with two forms of evidence to assess the likelihood that the survey estimates represent the true mean among MLTSS and FFS beneficiaries.

Table C.4. Odds ratios for MLTSS enrollees responding favorably on NCI-AD survey items, compared to FFS beneficiaries

Survey item[a] by domain	2015–2016			2016–2017			2017–2018			3–year average		
	Mean OR	95% CI	PP	Mean OR	95% CI	PP	Mean OR	95% CI	PP	Mean OR	95% CI	PP
Overall	**1.25**	**0.81-2.07**	**0.85**	**1.59**	**1.02-2.64**	**0.98**	**1.10**	**0.70-1.87**	**0.64**	**1.28**	**0.82-2.13**	**0.87**
Access	1.50	0.96-2.51	0.96	2.18	1.38-3.66	1.00	1.37	0.88-2.31	0.92	1.60	1.02-2.67	0.98
ACCESS_1A	1.53	0.97-2.58	0.97	1.68	1.04-2.82	0.98	1.09	0.68-1.83	0.63	1.39	0.88-2.31	0.93
ACCESS_1B	2.01	1.24-3.44	1.00	2.26	1.37-4.00	1.00	1.67	1.03-2.87	0.98	1.94	1.21-3.30	1.00
ACCESS_2A	1.35	0.85-2.28	0.90	1.88	1.16-3.28	0.99	1.47	0.93-2.49	0.95	1.52	0.97-2.56	0.97
ACCESS_2C	1.52	0.95-2.54	0.96	2.43	1.51-4.18	1.00	1.40	0.88-2.39	0.92	1.67	1.06-2.81	0.98
ACCESS_2D	1.30	0.82-2.20	0.86	1.94	1.16-3.34	0.99	1.35	0.84-2.30	0.89	1.47	0.92-2.47	0.95
ACCESS_2H	1.40	0.87-2.40	0.92	2.33	1.43-4.07	1.00	1.26	0.80-2.19	0.83	1.55	0.98-2.64	0.97
ACCESS_2K	1.47	0.92-2.49	0.95	2.97	1.84-5.10	1.00	1.43	0.90-2.44	0.94	1.76	1.11-2.98	0.99
Care coordination	1.12	0.70-1.88	0.67	1.43	0.89-2.45	0.92	0.95	0.59-1.63	0.39	1.12	0.71-1.89	0.67
CCOORD_1A	1.02	0.62-1.73	0.50	1.35	0.81-2.35	0.87	0.84	0.52-1.46	0.24	1.02	0.64-1.75	0.51
CCOORD_2A	1.24	0.77-2.11	0.80	1.52	0.92-2.69	0.95	1.06	0.66-1.84	0.57	1.24	0.78-2.11	0.81
Control	1.48	0.94-2.47	0.96	1.45	0.91-2.45	0.94	1.16	0.74-1.98	0.73	1.35	0.86-2.26	0.90
CONTRL_1A	1.48	0.94-2.47	0.96	1.45	0.91-2.45	0.94	1.16	0.74-1.98	0.73	1.35	0.86-2.26	0.90
Everyday living	1.27	0.81-2.15	0.85	1.54	0.97-2.61	0.97	0.90	0.57-1.53	0.32	1.18	0.75-1.98	0.76
EVDYLV_1C	1.18	0.73-1.99	0.76	1.40	0.87-2.44	0.92	0.86	0.54-1.47	0.26	1.10	0.69-1.86	0.64
EVDYLV_1D	1.37	0.86-2.32	0.91	1.70	1.06-2.86	0.98	0.95	0.6-1.63	0.39	1.27	0.81-2.13	0.85
Health care	1.14	0.73-1.87	0.70	1.33	0.86-2.23	0.90	1.14	0.73-1.92	0.69	1.19	0.76-1.98	0.77
HLTHCR_2A	1.08	0.68-1.79	0.61	1.58	0.98-2.70	0.97	0.99	0.62-1.68	0.45	1.16	0.74-1.94	0.73
HLTHCR_2B	0.99	0.62-1.65	0.45	0.99	0.62-1.68	0.46	1.08	0.69-1.84	0.61	1.02	0.65-1.71	0.51
HLTHCR_2C	1.06	0.67-1.77	0.58	1.11	0.70-1.87	0.66	1.19	0.75-2.02	0.76	1.12	0.71-1.87	0.67
HLTHCR_2D	1.26	0.80-2.09	0.84	1.58	1.00-2.67	0.97	1.40	0.88-2.38	0.93	1.39	0.89-2.32	0.93
HLTHCR_2E	1.19	0.75-1.98	0.77	1.14	0.71-1.91	0.70	1.15	0.72-1.93	0.70	1.16	0.74-1.94	0.73
HLTHCR_2F	0.98	0.61-1.63	0.45	1.12	0.69-1.89	0.66	1.20	0.76-2.06	0.78	1.10	0.69-1.82	0.63
HLTHCR_3B	1.37	0.87-2.32	0.92	1.77	1.09-3.03	0.99	1.03	0.65-1.76	0.52	1.32	0.84-2.24	0.89
HLTHCR_4A	1.24	0.77-2.11	0.81	1.60	0.98-2.79	0.97	1.11	0.68-1.89	0.64	1.27	0.80-2.16	0.85
Rights and respect	1.27	0.77-2.15	0.83	1.40	0.83-2.43	0.90	0.94	0.59-1.63	0.38	1.17	0.73-1.96	0.73
RGTRSP_2A	1.27	0.77-2.15	0.83	1.40	0.83-2.43	0.90	0.94	0.59-1.63	0.38	1.17	0.73-1.96	0.73
Relationships	1.29	0.78-2.23	0.83	1.60	0.93-2.90	0.95	1.26	0.77-2.22	0.81	1.36	0.83-2.32	0.89
RLTSHP_1A	1.29	0.78-2.23	0.83	1.60	0.93-2.90	0.95	1.26	0.77-2.22	0.81	1.36	0.83-2.32	0.89
Safety	1.34	0.84-2.29	0.90	1.57	0.98-2.70	0.97	0.96	0.60-1.64	0.42	1.24	0.78-2.10	0.83
SAFETY_1A	1.31	0.79-2.35	0.84	1.44	0.84-2.65	0.90	0.92	0.56-1.60	0.36	1.18	0.73-2.05	0.74
SAFETY_2A	1.11	0.66-1.97	0.63	1.26	0.73-2.31	0.79	0.82	0.49-1.44	0.22	1.03	0.64-1.79	0.52
SAFETY_5A	1.66	1.04-2.79	0.98	2.15	1.33-3.70	1.00	1.18	0.74-2.02	0.75	1.57	0.99-2.66	0.97
Satisfaction	1.19	0.76-1.98	0.77	1.39	0.88-2.36	0.92	1.04	0.66-1.78	0.54	1.18	0.75-1.99	0.76
STSFCN_1A	1.13	0.71-1.90	0.69	1.23	0.77-2.13	0.81	0.99	0.62-1.70	0.45	1.10	0.70-1.87	0.64
STSFCN_2A	1.31	0.81-2.24	0.87	1.33	0.80-2.35	0.87	1.02	0.64-1.76	0.51	1.20	0.75-2.03	0.78
STSFCN_3A	1.08	0.68-1.80	0.60	1.48	0.92-2.53	0.94	1.17	0.74-2.00	0.73	1.21	0.77-2.03	0.78

Table C.4 *(continued)*

Survey item[a] by domain	2015–2016			2016–2017			2017–2018			3–year average		
	Mean OR	95% CI	PP	Mean OR	95% CI	PP	Mean OR	95% CI	PP	Mean OR	95% CI	PP
STSFCN_3B	1.25	0.78-2.09	0.82	1.55	0.95-2.62	0.96	1.00	0.62-1.70	0.47	1.22	0.76-2.05	0.80
Service coordination	1.12	0.72-1.85	0.67	1.69	1.06-2.85	0.99	1.00	0.63-1.68	0.47	1.20	0.76-1.99	0.78
SVCCDN_2A	1.15	0.71-2.01	0.71	1.78	1.05-3.19	0.98	1.10	0.67-1.91	0.64	1.27	0.79-2.16	0.84
SVCCDN_3A	1.02	0.64-1.71	0.51	1.71	1.05-2.94	0.99	0.84	0.53-1.42	0.23	1.09	0.69-1.82	0.63
SVCCDN_4A	1.33	0.85-2.20	0.89	2.12	1.32-3.64	1.00	1.12	0.72-1.90	0.67	1.42	0.91-2.38	0.94
SVCCDN_8A	1.01	0.63-1.73	0.50	1.27	0.77-2.21	0.82	0.94	0.59-1.62	0.39	1.05	0.66-1.76	0.55

CI = credible interval; FFS = fee-for-service; MLTSS = managed long-term services and supports; OR = odds ratio; PP = posterior probability.

[a] Definitions of survey items are displayed in Table C.3.

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