

**THE EFFECTS OF MEDICAID MANAGED CARE ON
LONG-TERM SERVICES AND SUPPORTS (LTSS) FOR OLDER ADULTS:
EMPIRICAL EVIDENCE FROM MINNESOTA**

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Abstract

The United States is facing an aging population and a growing need for long-term services and supports (LTSS), which include institutional care (most commonly in nursing facilities (NFs)) and various home and community-based services (HCBS). Medicaid is the nation's primary payer for LTSS, and states increasingly favor Medicaid managed care to provide LTSS as opposed to the traditional fee-for-service approach. With capitated payments, managed care plans may have financial incentives to provide LTSS more efficiently, but they may also face pressure to reduce costs, which could lead to under-provision of services, with potential adverse impacts on beneficiaries' health. My dissertation fills the literature gap in the effects of Medicaid managed care on LTSS use, by investigating a Medicaid policy change in Minnesota which shifted more LTSS, including both HCBS and NF services, from fee-for-service to managed care for a group of Medicaid older adults (aged 65 and older) in the Minneapolis–St. Paul (MSP) metropolitan area during calendar years 2008–2009. I found that, after this policy change, the overall use and intensity of most HCBS did not change for the affected enrollees, except for a decrease in non-medical transportation. I found limited evidence suggesting that shifting LTSS to managed care had any effect on NF services. In addition, I found no change in the use of hospital and physician services after this policy, potentially implying that providing LTSS via managed care did not have negative effects on the older adults' health status. Later, I investigated changes in Medicaid older adults' demographics and LTSS use across the entire state of Minnesota during calendar years 2005–2017. My findings suggest that the state is facing a more diverse Medicaid LTSS population and that HCBS have taken over NF services as the primary LTSS option for the state's Medicaid older adults.

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List of Abbreviations

HCBS: Home and community-based services

LTSS: Long-term services and supports

MSC: Minnesota Senior Care

MSC+: Minnesota Senior Care Plus

MSHO: Minnesota Senior Health Options

MSP: Minneapolis–St. Paul

NF: Nursing facility

SD: Standard deviation

Introduction

Medicaid, the public health insurance program for low-income populations in the United States, covered more than 70 million people as of January 2020,² more than one-fifth of the nation's total population (Kaiser Family Foundation 2020). It operated at a cost of more than \$590 billion in fiscal year 2018 (Kaiser Family Foundation 2019). States can choose to provide Medicaid services through direct fee-for-service reimbursement to providers or by contracting with private or public managed care plans (insurers). The latter option has become increasingly popular in recent years, with the percentage of Medicaid beneficiaries enrolled in managed care for at least some Medicaid services increasing from 56 percent in 2000 to 90 percent in 2016 (Medicaid and CHIP Payment and Access Commission 2020). In Medicaid managed care, plans generally pay for services out of a fixed monthly capitated payment they receive for each enrollee. States have shifted to Medicaid managed care for various reasons, such as more control and predictability of future costs, greater accountability for outcomes, and better care management and coordination (Medicaid and CHIP Payment and Access Commission 2020). Capitated payments provide financial incentives for insurers to provide health care services more efficiently but could also potentially result in reductions in necessary care, particularly for high-cost enrollees (Layton, Ndikumana, and Shepard 2018).

States have yet to fully embrace managed care for all Medicaid services, including long-term services and supports (LTSS). LTSS, including institutional care

² Including both Medicaid and the Children's Health Insurance Program (CHIP) enrollments.

(most commonly in nursing facilities (NFs)) and various home and community-based services (HCBS, including home health, personal care, assisted living, adult day care, home modifications, and home-delivered meals, among others), are provided to individuals with functional and cognitive deficiencies, mostly older adults (aged 65 and older) and people with disabilities.³ Due to scant Medicare coverage and a small private insurance market for LTSS,⁴ Medicaid is and will likely remain the nation’s primary payer for LTSS; in 2017, it spent \$134 billion on LTSS, 57 percent of the nation’s total LTSS spending (Reaves and Musumeci 2015; Hado and Komisar 2019). The aging population is expected to further elevate Medicaid’s role in financing LTSS (Reaves and Musumeci 2015).

To promote plans’ participation in Medicaid managed care and ensure beneficiaries’ access to care, states have continued to directly reimburse health care providers on a fee-for-service basis for delivering certain high-cost services (i.e., “carve-outs”), including LTSS, even as other Medicaid benefits are provided by managed care plans (Layton, Ndikumana, and Shepard 2018; Lewis et al. 2018). However, states have recently shifted more financial responsibility for these services to managed care plans, in response to improvements in risk adjustment (i.e., capitated payments are adjusted to

³ HCBS are playing a more important role in LTSS, due to their lower costs compared to institutional care and beneficiaries’ preference of aging at home or in a home-like place (Medicaid and CHIP Payment and Access Commission 2018).

⁴ Medicare only pays for short-term, rehabilitation-focused skilled NF stays and for limited home health care services. Private LTSS insurance plays a small role in paying for LTSS, accounting for only 4 percent of national LTSS spending in 2017 (Hado and Komisar 2019). The small private insurance market for LTSS is due to issues including adverse selection, moral hazard, high administrative costs, and Medicaid crowd-out, among others (Norton 2016).

reflect that certain enrollees are more likely to require these services) and due to plans' improving capabilities in integrating care (Layton, Ndikumana, and Shepard 2018). For example, six states shifted at least some responsibility for LTSS to managed care in fiscal year 2015 (Smith et al. 2015). States also increased managed LTSS spending from \$32 billion in fiscal year 2015 to \$39 billion in fiscal year 2016 (Eiken et al. 2018). However, Medicaid managed care still has potential for further expansion in LTSS: in 2017, only three states covered all Medicaid LTSS benefits under managed care (Lewis et al. 2018).

There is very limited empirical evidence on the impacts of transitioning Medicaid LTSS from fee-for-service to managed care on use of LTSS and the resulting impacts on beneficiaries' health care use and health outcomes. One qualitative study found that states faced financial and administrative obstacles to achieve the goals of managed LTSS, such as improving care access and quality and lowering costs; and that reduced access to HCBS may happen at least temporarily under managed LTSS (Libersky et al. 2016). Another study found a lack of evaluation of managed LTSS outcomes, due to limited baseline data and scarce quality targets (Medicaid and CHIP Payment and Access Commission 2018). The Government Accountability Office found that states did not always provide the Centers for Medicare & Medicaid Services with sufficient information to monitor managed LTSS access and quality (Government Accountability Office 2017). Nearly all the existing Medicaid managed LTSS studies were based on surveys or interviews with state Medicaid officials. To the best of my knowledge, no prior empirical study has investigated the effects of shifting Medicaid LTSS from fee-for-service to managed care on the use and intensity of LTSS and beneficiaries' health or health care use.

In my dissertation, I fill this literature gap by studying a Medicaid policy change in the state of Minnesota, which shifted more LTSS, including both HCBS and NF benefits, from fee-for-service to managed care for a group of Medicaid older adults.⁵ In Minnesota, nearly 80 percent of all Medicaid beneficiaries are enrolled in a managed care plan, and managed care is generally mandatory for Medicaid older adults (Zimmerman and Marquardt 2018). Medicaid older adults can choose to enroll in a joint Medicaid–Medicare managed care program, or they can follow the default option to enroll in a Medicaid-only managed care program and receive their Medicare benefits separately (if eligible for Medicare). Prior to 2005, plans in the Medicaid-only managed care program were only responsible for a limited set of HCBS and the first 90 days of NF services for community-residing enrollees, and the rest HCBS and NF services were directly reimbursed on a fee-for-service basis by the state. Between 2005 and 2009, the state phased in a policy shifting responsibility for all HCBS and the first 180 days of NF services for community-residing enrollees to the Medicaid-only managed care program; this policy was phased in on a staggered basis across counties (Minnesota Department of Human Services 2007; 2008). In contrast, plans in the joint Medicaid–Medicare managed care program had already been responsible for all HCBS and the first 180 days of NF services for community-residing enrollees before this policy change, and there was no change of LTSS coverage for these plans during this period (Minnesota Department of Human Services 2007; 2008).⁶

⁵ Medicaid is formally referred as “Medical Assistance” in Minnesota.

⁶ The joint Medicare–Medicaid managed care program does not include more LTSS benefits compared to the Medicaid-only managed care program, since almost all LTSS benefits are covered under Medicaid.

My dissertation proceeds as follows. In Chapters 1 and 2, I focus on the Minneapolis–St. Paul (MSP) metropolitan area during calendar years 2008–2009. In this area, plans in the Medicaid-only program became responsible for expanded HCBS and NF services starting in 2009, when plans in the Joint Medicare–Medicaid program had already covered the expanded LTSS benefits before 2008. I compare changes in LTSS use and intensity from 2008 to 2009 in a treatment group formed by enrollees in the Medicaid-only plans, relative to a comparison group formed by enrollees in the joint Medicaid–Medicare plans offered by the same insurers. I use a difference-in-differences approach to estimate the impacts of managed care coverage of LTSS on the Medicaid older adults’ use and intensity of LTSS and hospital and physician services. In Chapter 1, I study the effects on HCBS and hospital and physician services, while in Chapter 2, I further investigate the impacts on NF services. In Chapter 3, I broaden my study scope to describe the trends in demographics and LTSS use among Medicaid older adults across the entire state of Minnesota during calendar years 2005–2017. I also separately stratify the study population based on age groups, status of living in the MSP metro area or not, and Medicaid managed care enrollment, to document differences in changes in LTSS use across the sub-groups. Finally, I conclude my dissertation by summarizing the findings and discussing the policy implications.

Chapter 1. The Effects of Medicaid Managed Care on Home and Community-Based Services (HCBS) for Older Adults: Empirical Evidence from Minnesota, 2008–2009

1.1. Background

1.1.1. Medicaid Managed Care

In Medicaid, managed care has taken over fee-for-service as the dominant approach for care provision (Medicaid and CHIP Payment and Access Commission 2020; Layton, Ndikumana, and Shepard 2018). In 2016, over 90 percent of the nation’s Medicaid beneficiaries were covered by managed care for some services, a sharp increase from about 56 percent in 2000; in fiscal year 2017, about half of Medicaid spending (over \$283 billion) was dedicated to managed care (Medicaid and CHIP Payment and Access Commission 2020). From a health economics perspective, Medicaid managed care is considered as a unique example of regulated competition, where managed care plans are more likely to compete for inclusion in the programs along states’ designated metrics rather than directly compete for enrollees; many Medicaid beneficiaries do not actively choose a plan due to low levels of premium and cost-sharing (Layton, Ndikumana, and Shepard 2018).^{7, 8} A survey found that during fiscal years 2015–2016, plan auto-

⁷ States can charge premiums and request out-of-pocket spending for Medicaid beneficiaries under certain limits; however, certain vulnerable groups (such as children and pregnant women) are exempt from most out-of-pocket costs, and copayments and coinsurance are not allowed for certain services (Medicaid.gov 2020a).

⁸ Examples of more common cases of regulated competition include Medicare (private Medicare Advantage plans and traditional fee-for-service Medicare) as well as the Affordable Care Act health exchanges, where individuals actively choose among multiple competing plans. In the case of Medicaid managed care, Medicaid beneficiaries are less likely to actively choose among plans, and states take a more active role during the plan procurement stage, when state Medicaid agencies can use regulations as

assignment rate was 45 percent for the median state and over 60 percent for ten states (Smith et al. 2015). Another topic with great relevance to health economics is services intentionally left out of Medicaid managed care arrangements, i.e., “carve-outs,” such as prescription drugs, behavioral health, dental services, and long-term services and supports (LTSS) (Layton, Ndikumana, and Shepard 2018). Studies noted that managed care plans had strong incentives of risk selection to stint services mainly used by high-cost individuals (Frank et al. 1996; Frank, Glazer, and McGuire 2000; Ellis and McGuire 2007). Although it may be efficient to keep such services under fee-for-service to ensure service access, states have recently been adding these services to managed care contracts, potentially due to states’ progress in risk adjustment and insurers’ improvement in care integration (Layton, Ndikumana, and Shepard 2018).

1.1.2. Medicaid: Primary LTSS Payer

LTSS includes institutional care and various home and community-based services (HCBS), such as home health, personal care, and home-delivered meals. LTSS are provided to individuals with functional and cognitive deficiencies, mostly older adults (aged 65 and older) and people with disabilities. Medicaid, as the nation’s primary LTSS payer, spent \$134 billion in 2017 (57 percent of the nation’s total LTSS spending) covering LTSS for older adults and people with disabilities (Hado and Komisar 2019). Medicaid’s leading role in LTSS financing is due to Medicare’s limited LTSS coverage

leverage to build a low-cost and high-quality network of plans, which is comparable to how health plans compete among themselves for a low-cost and high-quality network of health providers (Layton, Ndikumana, and Shepard 2018).

and a small private LTSS insurance market,⁹ and the aging population is expected to further elevate Medicaid's role in LTSS provision (Reaves and Musumeci 2015). States have been making great efforts to “rebalance” LTSS spending from institutional care (usually in nursing facilities (NFs) for older adults) to less-expensive HCBS (Kane, Priester, and Kane 2008; Watts and Musumeci 2018).¹⁰ This chapter specifically focuses on how managed care coverage may affect Medicaid older adults' use of HCBS.

1.1.3. Literature Gap: Medicaid Managed Care on LTSS

There is a major literature gap at the intersection of Medicaid managed care and LTSS. In Medicaid managed care, limited research has looked into Medicaid managed care for LTSS empirically, with only a few policy reports based on survey and interview results with state Medicaid officials. The impacts of providing LTSS via Medicaid managed care vs. fee-for-service Medicaid on LTSS use and quality have largely been overlooked. Previous policy reports found a lack of evaluation of managed LTSS outcomes, due to limited baseline data and scarce quality targets, and one report also found that states did not always provide the Centers for Medicare & Medicaid Services with sufficient information to monitor LTSS access and quality in Medicaid managed care (Medicaid and CHIP Payment and Access Commission 2018; Government Accountability Office 2017). States have accelerated adopting Medicaid managed care in LTSS provision, and they increased managed LTSS spending by 24 percent from fiscal year 2015 (\$32 billion)

⁹ Please refer to Footnote 4.

¹⁰ Reasons for states' Medicaid LTSS rebalancing efforts include beneficiaries' growing preferences for HCBS and states' obligations under the Supreme Court's 1999 *Olmstead v. L.C.* decision, which found that unjustified institutionalization of persons with disabilities violates the Americans with Disabilities Act (Reaves and Musumeci 2015).

to fiscal year 2016 (\$39 billion) (Eiken et al. 2018). As states start to add some or all LTSS benefits under Medicaid managed care, HCBS are expected to play a more important role due to their lower costs compared to NF services and beneficiaries' preferences of aging at home or in a home-like place (Medicaid and CHIP Payment and Access Commission 2018). Chapters 1 and 2 of my dissertation fill in the literature gap on the effects of shifting Medicaid LTSS benefits from fee-for-service to managed care on older adults' LTSS use by investigating a Medicaid policy change in the state of Minnesota, with this chapter focusing on HCBS and next one on NF services. In addition, I also investigate potential effects on Medicaid older adults' use of hospital and physician services, to indirectly measure their health outcomes.

This chapter proceeds as follows. Section 2 describes the study framework, including Minnesota's policy change details, the theoretical framework, and hypotheses. Section 3 introduces the study method, including the data source, measures, and econometric model specification. Sections 4 and 5 show the results of the main analysis and extensions, respectively. Section 6 discusses the results and draw policy implications. Last, Section 7 provides an overview of the findings and study conclusions.

1.2. Study Framework

1.2.1. Medicaid Managed Care for Older Adults in Minnesota

Older Adults in Minnesota's Medicaid program have been generally required to enroll in managed care since the early 1980s, with a few excluded categories (for example, individuals with medical spenddowns or terminal illness) (Minnesota Department of Human Services 2007; 2008). Medicaid older adults in Minnesota are currently required

to enroll in a default Medicaid-only managed care program, or they can voluntarily enroll in a joint Medicare–Medicaid managed care program (Punelli 2017).

During calendar years 2005–2009, Minnesota replaced the mandatory Medicaid-only managed care program, named “Minnesota Senior Care (MSC),” with a new program called “Minnesota Senior Care Plus (MSC+).” The policy change was implemented in phases across the state, with the seven-county Minneapolis–St. Paul (MSP) metropolitan area (i.e., Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington counties) shifting to MSC+ on January 1, 2009 (Minnesota Department of Human Services 2007; 2008). MSC and MSC+ differed mainly in terms of managed care coverage for LTSS: MSC covered certain HCBS (i.e., home health and personal care) while the state directly reimbursed providers of other HCBS options via fee-for-service Medicaid, such as assisted living, home-delivered meals, and non-medical transportation; under MSC+, all HCBS were shifted to managed care (Minnesota Department of Human Services 2007; 2008). In terms of NF services coverage, MSC only covered the first 90 days in an NF for community-residing enrollees, while MSC+ covered the first 180 days (Minnesota Department of Human Services 2007; 2008).

In 1997, Minnesota started to offer the joint Medicare–Medicaid managed care program under federal Medicare Special Needs Plan authority, named “Minnesota Senior Health Options (MSHO),” in the MSP metro area (Minnesota Department of Human Services 2008; Punelli 2017).¹¹ MSHO offers the same Medicaid coverage as MSC+,

¹¹ A Medicare Special Needs Plan (SNP) is a Medicare Advantage plan “specifically designed to provide targeted care and limit enrollment to special needs individuals,” including those who are institutional, who

plus all Medicare services including short-term post-acute skilled NF services and Part D prescription drug benefits (Minnesota Department of Human Services 2008). In terms of managed care LTSS benefits, MSHO provides the same benefits as MSC+. Most insurers offering managed care plans for Minnesota’s Medicaid older adults participate in both the joint Medicare–Medicaid and Medicaid-only programs (Minnesota Department of Human Services 2018a).

1.2.2. HCBS Shifted to the Medicaid-Only Managed Care Program

Three benefits account for the majority of national Medicaid HCBS spending: home health, personal care, and services under the 1915(c) HCBS waiver (a Medicaid waiver aiming to provide HCBS to beneficiaries at risk of institutional placement) (Reaves and Musumeci 2015; Watts and Musumeci 2018). Among the three HCBS categories, 1915(c) waiver services covered 50 percent of Medicaid beneficiaries receiving HCBS and made up 70 percent of Medicaid’s total HCBS spending across the nation in 2014 (Watts and Musumeci 2018).

Minnesota’s 1915(c) waiver for older adults is named as the “Elderly Waiver.” Elderly Waiver HCBS were those that were shifted to managed care from fee-for-service during the transition from MSC to MSC+ of the Medicaid-only managed care program. Based on 2008–2009 claims, the most commonly used Elderly Waiver HCBS included companion services, home-delivered meals, homemaker services, adult day care, assisted living,¹² and non-medical transportation. Elderly Waiver HCBS also included case

are Medicare–Medicaid dual-eligible, or those with a severe or disabling chronic condition (Centers for Medicare & Medicaid Services 2019). MSHO is an SNP for dual-eligibles.

¹² Assisted living is formally referred as “customized living” in Minnesota.

management,¹³ chore services, consumer directed community supports, environmental accessibility adaptations, extended home health services, extended personal care assistance, family caregiver services, foster care, and transitional services, among others.

Exhibit 1-1 shows the corresponding HCBS coverage in the Medicaid-only (MSC(+)) and joint Medicare–Medicaid managed care (MSHO) programs during 2008–2009.

Medicaid managed care capitation rates (paid monthly) were set up in the same way for both MSC(+) and MSHO, as shown in **Exhibit 1-2** (Minnesota Department of Human Services 2014). A basic care component applied to all Medicaid older adults, with adjustment made for institutional vs. community status, Medicare status, age, and geographic region. For community-residing enrollees, an NF add-on was included, which was not conditional on an NF admission and was designed to cover risk of NF services use; the NF add-on was paid to managed care plans until the number of managed care NF days reached a corresponding cap (to be further discussed in Chapter 2). For community-residing enrollees who have the Elderly Waiver, an Elderly Waiver add-on was also paid. The add-ons were based on recent levels and trends of services use, with adjustments including functional status, age, and geographic region, and they were not plan-specific.

1.2.3. Study Design

In this chapter, I focus on the seven-county MSP metro area during the calendar years 2008–2009, one year before and one year after more HCBS were added into the Medicaid-only managed care program on January 1, 2009. I use enrollees in the

¹³ Case management is required under the Elderly Waiver, but managed care plans did not always submit claims for this service based on the 2008–2009 data, potentially because the plans provided or arranged the provision of case management by themselves.

Medicaid-only managed care program (MSC(+)) as the treatment group and those in the joint Medicare–Medicaid managed care program (MSHO) as the comparison group. In the comparison group, there was no change in managed LTSS benefits during the study period. In the main analysis, I further restrict the study population as those in both groups who had 12-month HCBS use in the pre-period (calendar year 2008) and continuously enrolled in the corresponding program under the same insurer for 24 months during 2008–2009.

For the comparison group throughout the study period and the treatment group in the post-period, for each enrollee who was an Elderly Waiver recipient (i.e., those who could use any of the shifted managed care HCBS in the treatment group), the managed care plans could get a prospective increase in their capitated payment (i.e., the Elderly Waiver add-on). Facing an increase in capitated payments alongside more HCBS responsibilities, the managed care plans would have financial incentives to lower the costs of providing HCBS, potentially by integrating the new services with existing ones or simply stinting on certain services. Any change in HCBS provision under managed care may also have had subsequent effects on the enrollees' health status in the treatment group. In this chapter, I investigate the impacts of managed care HCBS coverage on the enrollees' use and intensity of HCBS and hospital and physician services, with the latter as indirect measures of enrollees' health outcomes.

1.2.4. Theoretical Framework

All insurers in this study were nonprofits; in fact, for-profit insurers had been prohibited from operating as health maintenance organizations in Minnesota for nearly five decades until 2019 (Livingston 2018). Economic theories on health insurer ownerships are largely

borrowed from those on hospital ownerships, which indicate that nonprofits may behave in the range between for-profits maximizing profits and altruists maximizing social welfare; empirical evidence suggests that nonprofit insurers may value both profits and quality (possibly reflected by enrollee satisfaction in some cases) (Pauly et al. 2002; Town, Feldman, and Wholey 2004; Gillies et al. 2006; Long 2008; Chang and Jacobson 2012; Dafny 2019).¹⁴ In the case of Medicaid managed care, insurers would also value quality and enrollee satisfaction due to states' quality standards and monitoring efforts.

Each enrollee in either the joint Medicare–Medicaid or Medicaid-only managed care program was matched with a “case manager” or “care coordinator” hired by the health plan (Minnesota Department of Human Services 2008). In the context of this study, for the treatment group, in the pre-period, the health plans did not have too strong an incentive for cost control (through the case managers or care coordinators they hired) of the Elderly Waiver HCBS (i.e., the HCBS shifted to the Medicaid-only managed care program from fee-for-service) because these benefits were reimbursed by the state under fee-for-service; in the post-period, with capitation payments, the health plans were expected to have stronger incentives for cost control, which may lead to a decrease in the

¹⁴ From a profit-maximizing standpoint, previous research has shown that under a prospective payment system, an increase in either average or marginal reimbursement would increase probability of receiving care and intensity of care (Hodgkin and McGuire 1994; Ellis and McGuire 2007; Sood et al. 2013). In the context of this study, for each Elderly Waiver recipient, the managed care plans in both the treatment and comparison groups could get an Elderly Waiver add-on, which could be considered as an increase (from zero) in both average and marginal reimbursements for the Elderly Waiver HCBS for the treatment group plans. Thus, it could be predicted that the probability of getting the Elderly Waiver would increase in the post-period for Medicaid older adults in the treatment group plans (assuming the Elderly Waiver add-on would be sufficient to cover the average cost of providing the Elderly Waiver HCBS).

use of certain HCBS. However, in theory, nonprofit insurers would also consider quality and/or enrollee satisfaction (such as continuation of care) alongside profits. Therefore, I would make the following hypotheses.

Since the managed care plans could get a prospective increase in the capitated payment (i.e., the Elderly Waiver add-on) for each Elderly Waiver enrollee (although with more HCBS responsibilities and costs), they may enroll more older adults into the Elderly Waiver.

Now that the treatment group managed care plans were responsible for an extended set of HCBS, they may change the composition and/or reduce the overall quantity of HCBS provided.

They may provide more high-value services (high efficacy relative to costs) and fewer lower-value ones (lower efficacy relative to costs). In particular, services impacting well-being other than health and health care (and thus not affecting the financial bottom line of the plans) may be particularly affected.

Meanwhile, the plans' greater responsibility for NF services may change the composition of LTSS (i.e., HCBS vs. NF services) provided.

Because the managed care plans were all nonprofit, they may behave as profit maximizers but also have concerns for quality. The plans would be less likely to cut HCBS for enrollees who needed HCBS the most (for example, those with less family support). Also, increases in hospital and physician services use or intensity would be

unlikely to happen, especially when the insurers were also financially responsible for those services.¹⁵

1.3. Methods

1.3.1. Setting and Population

This chapter studies the seven-county MSP metro area (including Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington counties) and covers calendar years 2008–2009 (24 months). In this geographic area, MSC+ replaced MSC on January 1, 2009, with additional coverage of HCBS and NF services shifted from fee-for-service to managed care. This chapter focuses on the effects of managed care coverage on use and intensity of HCBS, while the next chapter focuses on NF services. There were five insurers offering Medicaid managed care plans for older adults in this area, and they all participated in both the Medicaid-only managed care program (i.e., MSC(+)) and the joint Medicare–Medicaid managed care program (i.e., MSHO) in both years.

Study population was Medicaid beneficiaries aged 65 and older who continuously enrolled in either the Medicaid-only program (treatment group) or the joint Medicare–Medicaid program (comparison group) for all 24 months under the same insurer, with continuous HCBS use (including home health, personal care, and/or the Elderly Waiver HCBS such as assisted living, adult day care, and home-delivered meals) for all 12 months in the pre-period (calendar year 2008).

¹⁵ The Medicaid–Medicaid managed care plans would be financially responsible for Medicare-covered hospital and physician services and Medicaid cost sharing for those services, while the Medicaid-only managed care plans would be financially responsible for Medicaid cost sharing.

1.3.2. Data Source

All data were obtained from Minnesota's Medicaid Management Information System, covering calendar years 2007–2009.¹⁶ Information included beneficiaries' Medicaid enrollment status, demographics, and diagnoses, as well as fee-for-service and managed care encounter claims.¹⁷

1.3.3. Measures

The primary outcomes included the proportion of enrollees who used any Elderly Waiver HCBS (i.e., the category of HCBS shifted from fee-for-serve to managed care for the treatment group) during the month; and use and intensity of the most common Elderly Waiver HCBS, including companion services, home-delivered meals, homemaker services, adult day care, assisted living, and non-medical transportation. Secondary outcomes were use and intensity of home health and personal care, the two categories of HCBS not covered under the Elderly Waiver (i.e., the HCBS already covered in managed care for both the treatment and comparison groups before the study period). Additionally, I also investigated use and intensity of various hospital and physician services, including hospital inpatient stays, hospital outpatient visits, ER visits without hospitalization, and physician visits. Two measures were calculated for each of the HCBS and hospital and physician services mentioned above: (1) proportion of enrollees who used any of the

¹⁶ Diagnoses from calendar year 2007 were used to calculate a Charlson Comorbidity Index with a 12-month look-back period for each month in the study period (calendar years 2008–2009).

¹⁷ The data for this dissertation is under a data re-use agreement for a University of Minnesota project (titled *Nursing Facility Rates and Policy*), a collaborative arrangement with the Minnesota Department of Human Services.

service during the month; (2) average intensity of use of the service during the month (except assisted living, for which claims were submitted on a monthly basis).

The key explanatory variable was an interaction term between a binary indicator for the treatment group and another binary indicator for the post-period. All regressions controlled for demographics including age (65–69; 70–74; 75–79; 80–84; 85 and older), gender, race/ethnicity (Asian; Black; Hispanic; multiple; Native; Pacific; White; unknown), marital status (divorced; legally separated; married and living with spouse; never married; married but living separately from spouse; widowed; unknown), and a Charlson Comorbidity Index using a 12-month look-back period for diagnoses.

1.3.4. Statistical Analyses

The unit of analysis was a beneficiary-month. First, I performed a descriptive analysis comparing beneficiary characteristics between the treatment and comparison groups in January 2008, using unpaired, 2-tailed t-tests with standard errors clustered at the county and insurer interaction level (32 clusters). In order to confirm that the financial responsibility for the Elderly Waiver HCBS shifted from fee-for-service Medicaid to Medicaid managed care for the treatment group plans, I plotted the claims paid by managed care as a proportion of all claims (i.e., fee-for-service plus managed care) for the most common Elderly Waiver HCBS during the study period. I also performed descriptive analyses plotting the probability and intensity of use for the most common Elderly Waiver HCBS and other non-Elderly Waiver HCBS for the enrollees in the treatment (MSC(+)) and comparison (MSHO) groups over the study period.

Then, I used a difference-in-differences approach to formally estimate and test whether the outcomes changed differentially between the treatment vs. comparison group

after more HCBS were shifted to managed care from fee-for-service in the treatment group in the post-period, by estimating a linear regression model. The model is specified as follows:

$$Outcome_{imcp} = \beta Treatment_After_{imp} + \gamma Enrollee_{im} + \delta_m + \zeta_c + \eta_p + \varepsilon_{imcp}$$

In the specification, $Outcome_{imcp}$ is the outcome for enrollee i measured in month m who resided in county c and enrolled in managed care plan p (in the Medicaid-only or joint Medicare–Medicaid program) under. $Treatment_After_{imp}$ equals to one if enrollee i was in a Medicaid-only managed care plan in the post-period (calendar year 2009) or zero otherwise. $Enrollee_{im}$ represents a set of enrollee demographics at month m , including age, gender, race/ethnicity, marital status, and a Charlson Comorbidity Index. δ_m , ζ_c , η_p are month (24 months), county (seven counties), plan (one Medicaid-only and one joint Medicaid–Medicaid plan offered by each of the five insurers) fixed effects, respectively. ε_{imcp} is the error term. Standard errors were clustered at the county and insurer interaction level in all estimations. β is the estimate of interest, which measures the differential within-insurer change in HCBS or hospital and physician services use for enrollees in an MSC(+) vs. MSHO plan after the policy change. I also investigated the likelihood of parallel trends between the treatment vs. comparison group in the pre-period, which is an important assumption to draw casual conclusions in a difference-in-differences approach.¹⁸

¹⁸ The parallel trends assumption cannot be formally tested. My assumption is that the change for MSHO enrollees represented what would have happened in the post-period for MSC(+) enrollees in the absence of the policy change. I can only determine the likelihood that this holds by looking at pre-trends.

1.4. Results

1.4.1. Observation Counts

For this analysis, I focused on Medicaid older adults in the MSP metro area who continuously enrolled in either the Medicaid-only or joint Medicare–Medicaid program for all 24 months under the same insurer during the two-year study period (calendar years 2008–2009), with continuous HCBS use for all 12 months in the pre-period (calendar year 2008).

During the 24-month period of 2008–2009, 28,073 Medicaid older adults in the metro area enrolled in a managed care plan at least for a month, among which 13,972 (49.77%) continuously enrolled in a managed care plan. Among those enrolled in a managed care plan for 24 months, 13,244 (94.79%) were continuously served by the same insurer. Among those served by the same insurer for 24 months, 2,623 (19.81%) continuously enrolled in the Medicaid-only managed care program (i.e., MSC(+)), 9,478 (71.56%) continuously enrolled in the joint Medicare–Medicaid managed care program (i.e., MSHO), while the rest, 1,143 (8.63%) switched between the two programs. With the additional restriction of continuous HCBS use for 12 months in the pre-period (calendar year 2008), 5,590 Medicaid older adults continuously enrolled in a managed care plan in 2008–2009, and 5,262 of them (94.13%) were continuously served by the same insurer, among which, 1,275 (24.23%) continuously enrolled in the Medicaid-only plan, 3,658 (69.52%) continuously enrolled in the joint Medicare–Medicaid program, while the others, 329 (6.25%), switched between the two plans. In the main analysis, I used the 1,275 Medicaid-only managed care plan enrollees with pre-period HCBS use as

the treatment group and the 3,658 joint Medicare–Medicaid managed care plan enrollees with pre-period HCBS use as the comparison group. **Exhibit 1-3** provides more details on how the observations break down into the five insurers in the metro area, all of which operated in both programs during 2008–2009.

1.4.2. Baseline Beneficiary Characteristics

Demographics of the study population in the treatment and comparison groups were similar in some measures and different in others in January 2008 (the first month in the pre-period) (**Exhibit 1-4**). The mean age was 77.46 (standard deviation (SD) 7.53) vs. 77.16 (SD 7.51) in the treatment vs. comparison group, respectively (P=0.541). Proportion of females was 72.08% vs. 73.59% in the treatment vs. comparison group, respectively (P=0.515). In terms of race/ethnicity, compared to the beneficiaries in the comparison group, those in the treatment group were less likely to be Asian (6.04% vs. 31.63%, P<0.001) or Hispanic (0.31% vs. 1.86%, P<0.001), and more likely to be White (84.39% vs. 47.76%, P<0.001).¹⁹ Regarding marital status, compared to the beneficiaries in the comparison group, those in the treatment group were less likely to be divorced (12.78% vs. 18.62%, P=0.006), married but living separately from spouse (12.24% vs. 18.70%, P=0.004), or never married (8.08% vs. 11.59%, P=0.031), and more likely to be married and living with spouse (20.55% vs. 8.45%, P=0.025). The health status measured by the Charlson Comorbidity Index and based on diagnoses in a 12-month look-back

¹⁹ Based on a meeting between a team of staff from the Minnesota Department of Human Services and the author on July 17, 2019 in St. Paul, MN, one of the reasons why MSHO had a higher proportion of minority beneficiaries was that MSHO plans made more outreaching efforts in minority communities, including hiring foreign-language speaking case managers.

period was similar between the two groups, with a mean of 1.34 (SD 1.61) vs. 1.29 (SD 1.56) in the treatment vs. comparison group, respectively.²⁰

Although the treatment and comparison groups differed in some demographic characteristics, the comparison group could still serve as a good counterfactual to measure changes in the outcomes. I will investigate this by looking at their pre-period trends in the outcomes, as further explained later.

1.4.3. Switch from Fee-for-Service to Managed Care in Claims

The policy change of shifting more HCBS (i.e., the Elderly Waiver HCBS) from fee-for-service to managed care for the Medicaid older adults in the treatment group (i.e., in the Medicaid-only managed care plan, MSC(+)) took place on January 1, 2009, which can be verified in the claims data. **Exhibit 1-5** illustrates how the proportion of managed care claims among fee-for-service plus managed care claims for each of the six most commonly used Elderly Waiver HCBS changed during the study period. In the treatment group, the proportion of managed care claims went from 0.06% in the pre-period (calendar year 2008) to 100.00% in the post-period (calendar year 2009) for companion services, from 6.02% to 99.84% for home-delivered meals, from 1.11% to 99.71% for homemaker services, from 2.74% to 99.81% for adult day care, from 13.79% to 99.37% for assisted living, and from 0.82% to 99.90% for non-medical transportation, all with a sharp spike in the first quarter of 2009. In the comparison group, where no benefit change happened during the study period, the proportions of managed care claims all stayed very close to 100.00% throughout 2008–2009.

²⁰ According to the original development sample for the Index, a score of 1-2 would suggest an one-year mortality rate of 26% (Charlson et al. 1987).

1.4.4. Differential Changes in Outcomes

1.4.4.1. HCBS That Were Newly Shifted to Managed Care

Exhibit 1-6 illustrates the trends in use and intensity for the six most commonly used Elderly Waiver HCBS (i.e., the HCBS added in managed care for the treatment group) between the treatment vs. comparison group (i.e., the Medicaid-only plan vs. the joint Medicare–Medicaid managed care plan, or MSC(+) vs. MSHO) enrollees during 2008–2009. The graphs indicate a decrease in Elderly Waiver homemaker and non-medical transportation services for the treatment group in the post-period (calendar year 2009), in terms of both service use and intensity. **Exhibit 1-9** shows the results from the difference-in-differences model, and **Appendix Exhibit 1-1** shows the unadjusted means of the outcomes in the treatment and comparison groups in the pre and post-periods. Proportion of beneficiaries who used any Elderly Waiver homemaker services decreased more by 32.26 percentage points for the treatment group (95% CI -48.04 to -16.48 percentage points, $P < 0.001$), compared to the comparison group, translating to a 77.87% decrease from the treatment group’s pre-period mean. In terms of unconditional intensity of Elderly Waiver homemaker services, the number decreased more by 479.92 minutes per month for the treatment group (95% CI -725.16 to -234.69, $P < 0.001$), an 82.18% decrease from the treatment group’s pre-period mean. As for proportion of beneficiaries who used any Elderly Waiver non-medical transportation services, it decreased more by 8.00 percentage points for the treatment group (95% CI -12.48 to -3.52 percentage points, $P = 0.001$), a 27.73% decrease from the treatment group’s pre-period mean. The unconditional intensity of the Elderly Waiver non-medical transportation decreased more by 5.03 times per month for the treatment group (95% CI -6.47 to -3.59, $P < 0.001$),

equaling to a decrease of 82.46% from the treatment group's pre-period mean. I did not find any statistically significant differential change for the other Elderly Waiver HCBS, or proportion of beneficiaries as Elderly Waiver recipients.

1.4.4.2. More on Homemaker Services

Based on the claims, the managed care plans could bill homemaker services in two ways: either under the Elderly Waiver or non-Elderly Waiver home health category (a HCBS benefit already covered by managed care for both the treatment and comparison groups before the pre-period).²¹ Therefore, I further investigated if the relative decrease in Elderly Waiver homemaker services (i.e., an added HCBS benefit in managed care) for the treatment group was accompanied by a relative increase in non-Elderly Waiver homemaker services (i.e., an existing HCBS benefit in managed care). **Exhibit 1-7** shows the trends in Elderly Waiver, non-Elderly Waiver, and combined homemaker services between the treatment vs. comparison group during 2008–2009. **Exhibit 1-9** continues to show the results from the difference-in-differences model for these outcomes. Proportion of beneficiaries who used any non-Elderly Waiver home health homemaker services increased more by 33.04 percentage points for the treatment group in the post-period, compared to the comparison group (95% CI 16.67 to 49.41 percentage points, $P < 0.001$), an increase of 23.77 times the treatment group's pre-period mean. The unconditional intensity of non-Elderly Waiver homemaker services increased more by 523.42 minutes per month for the treatment group (95% CI 261.37 to 785.47, $P < 0.001$), an increase of 40.33 times the treatment group's pre-period mean. If Elderly Waiver and non-Elderly

²¹ However, according to the claims, non-medical transportation was not billed under non-EW HCBS categories.

Waiver homemaker services were combined, then differential change between the treatment vs. comparison group was not statistically significant. The unconditional intensity of combined Elderly Waiver and non-Elderly Waiver homemaker services climbed more by 43.49 minutes per month for the treatment group (95% CI 6.06 to 80.93, P=0.024), translating to a milder 7.3% increase from the treatment group's pre-period mean. However, the last estimate was not robust to adjustment for multiple comparisons with a Bonferroni correction; with 28 outcomes in the main analysis, the P-value threshold for a significance level of 0.05 was 0.002 (0.05 divided by 28).

1.4.4.3.HCBS That Were Already Existing in Managed Care

Non-Elderly Waiver HCBS include two categories, home health and personal care, both of which had already been covered by managed care in both the treatment and comparison groups before the pre-period. Consistent with the relative increase of homemaker services billed under non-Elderly Waiver home health for the treatment group in the post-period, I also found a relative increase of 16.79 percentage points in any use of home health for the treatment group (95% CI 7.79 to 25.79, P=0.001). However, in terms of any non-homemaker home health use, there was no differential change. Due to the varying units of different home health service descriptions, I was not able to measure intensity of home health as an outcome.²² In terms of personal care use and intensity, I did not find any statistically significant differential change. More details are shown in **Exhibit 1-9**.

1.4.4.4.Hospital and Physician Services

²² For example, under home health, homemaker and activity therapy services were mostly billed in the unit of minutes, while nurse assessment or evaluation was mostly billed in the unit of times.

Changes in LTSS delivery from fee-for-service to managed care may also have effects on beneficiaries' health status, for which I indirectly measured with hospital and physician services use and intensity due to data limitation. I investigated the use and intensity of inpatient hospital stays, outpatient hospital visits, ER visits without hospitalization and physician services, with the trends between the treatment vs. comparison group during 2008–2009 shown in **Exhibit 1-8** and the difference-in-differences results shown in **Exhibit 1-10**.²³ I did not find any statistically significant differential change for use of any the hospital and physician services, but I did find that the unconditional intensity of hospital inpatient stays increased more by 0.01 time per month for the treatment group in the post-period (95% CI 0.00 to 0.02), compared to the comparison group, translating to a 33.33% increase from the treatment group's pre-period mean. I also found that the unconditional intensity of physician services increased more by 0.09 time per month for the treatment group (95% CI 0.01 to 0.17), a 4.27% increase from the treatment group's pre-period mean. However, neither of the last two estimates was robust under the Bonferroni correction mentioned above.

1.4.5. Tests for Pre-Period Parallel Trends

Parallel trends between the treatment and comparison groups in the pre-period is an important assumption to draw any casual conclusion from a difference-in-differences model. I determined the likelihood that this holds using the following approach. I regressed pre-period outcomes on treatment and quarterly indicators and the interaction between the treatment indicator and each quarterly indicator, using the last quarter in the

²³ Limited to maximum of one event per day for the following outcomes because multiple events on the same day are not identifiable in the claims data: ER visits without hospitalization; physician services.

pre-period (2008Q4) as the reference quarter. Then I conducted an F-test for the hypothesis that the coefficient estimates for all three treatment and quarterly interaction terms (Treatment*2008Q1, Treatment*2008Q2, and Treatment*2008Q3) jointly equaled to zero. **Appendix Exhibit 1-2** shows the F-test results, alongside the coefficient estimate and 95% CI for each of three interaction terms, suggesting that the original hypothesis could not be rejected at a significance level of 0.05 for a majority of the outcomes (suggesting that the parallel pre-trend assumption was likely to hold for these outcomes). Among the outcomes from which I found statistically significant differential changes (after the Bonferroni correction), the pre-period parallel trend assumption was not likely to hold only for intensity of non-medical transportation ($P < 0.001$). However, for this outcome, the coefficient estimates for the three interaction terms were small in magnitude compared to the treatment group's pre-period mean (-0.97, -0.52, and -0.26 compared to 6.10; treatment group's pre-period mean shown in **Exhibit 1-9**), alleviating concerns that non-parallel pre-trends could contribute to much of the differential change.

1.5. Extensions

1.5.1. No Restriction of HCBS Use in the Pre-Period

In the first extension, I dropped the restriction of 12-month HCBS use in the pre-period on the study population. In this setting, I was able to investigate an additional outcome: proportion of beneficiaries receiving any HCBS (Elderly Waiver HCBS, and/or home health, and/or personal care). This additional outcome would measure a bottom-line effect of additional managed care LTSS benefits on overall HCBS use among the community-residing and non-community-residing enrollees. **Appendix Exhibits 1-3 and**

1-4 show the difference-in-differences results for this extension. I did not find any statistically significant differential change for the additional outcome. Regarding the outcomes in the main analysis, all of the conclusions continued to hold.

1.5.2. Support from Spouse

In the second extension, I added an additional restriction of no support from spouse (defined from marital status) for all 24 months in the study period on the study population. This was motivated by two facts. First, most LTSS are delivered by unpaid informal caregivers such as family and friends, valued at an estimate of \$470 billion in 2013 (Thach and Wiener 2018; Reinhard et al. 2015). Second, although I could not measure unpaid LTSS provided by informal caregivers in the claims data, I did notice that a majority of the study population in the main analysis had a marital status of “divorced,” “legally separated,” “married but living separately from spouse,” “never married,” or “widowed,” suggesting a lack of support from spouse (79.37% of the beneficiaries in the treatment group and 91.50% in the comparison group in the baseline, as shown in **Exhibit 1-4**). If fewer HCBS were provided in managed care, such beneficiaries would have more difficulty to obtain help of a spouse (although I could not measure the availability of other potential informal caregivers, such as children or friends). **Appendix Exhibits 1-5 and 1-6** show the difference-in-differences results for this extension. The conclusions in the main analysis held in this extension, although in terms of the point estimates, the relative decrease in Elderly Waiver homemaker services and non-medical transportation (both added HCBS in managed care for the treatment group in the post-period) and the relative increase in non-Elderly Waiver homemaker services (an existing HCBS benefit in managed care for both the treatment and

comparison groups before the pre-period) were smaller for the treatment group, compared to the main analysis results.

1.5.3. Service Intensity Without Outliers

In the third extension, for each HCBS benefit, I dropped the top 5% claims with the highest recorded service quantities during the study period to re-measure service intensity. This was driven by concerns that high outlier values may unproportionally influence the conclusions for intensity outcomes. **Appendix Exhibit 1-7** shows the corresponding difference-in-differences results. Within expectation, the pre-period treatment group means all shrank. Still, the conclusions from the main analysis held under this extension, although I found a statistically significant relative decrease in intensity of non-Elderly Waiver personal care services (an existing HCBS benefit in managed care for both the treatment and comparison groups before the pre-period) of 567.68 minutes per month for the treatment group (95% CI -1055.40 to -79.95, P=0.024) in the post-period, translating to a 29.20% decrease from the treatment group's pre-period average level. However, this estimate was not robust under the Bonferroni correction mentioned above.

1.6. Discussion

As managed care is replacing fee-for-service as the dominant approach to deliver Medicaid services, more Medicaid LTSS benefits are now being provided via managed care for older adults across the nation. Minnesota is a national pioneer in Medicaid managed care for older adults, where mandatory managed care enrollment for Medicaid older adults started early in the 1980s (Minnesota Department of Human Services 2007;

2008). In this chapter, I provided potentially the first empirical evidence on the effects of Medicaid managed care on older adults' LTSS use, more specifically on their HCBS use, by investigating a Medicaid policy change in Minnesota, which shifted more LTSS from fee-for-service to managed care for a group of Medicaid older adults in the MSP metro area at the beginning of 2009.

I found that the overall use and intensity of most HCBS did not change for affected enrollees, but I did find reductions in non-medical transportation, which helps Medicaid older adults gain access to waiver and community resources and activities (Minnesota Department of Human Services 2019). For the treatment group, the proportion of beneficiaries who used this service during a month decreased more by 8 percentage points relative to the comparison group, translating to a 28% decrease from the treatment group's pre-period mean; the frequency of trips also decreased more by 5 times per month for the treatment group, equaling to a decrease of 82% from the treatment group's pre-period mean. I also found a relative decrease in both use and intensity of homemaker services billed under the Elderly Waiver HCBS category, which was shifted to managed care from fee-for-service for the treatment group in the post-period; however, such a decrease was balanced off by a relative increase in homemaker services billed under the non-Elderly Waiver home health HCBS category, which had already been covered by managed care before the pre-period for both treatment and comparison groups.

Based on the theoretical framework, nonprofit insurers may have dual goals for both higher quality and profits. While making a decision to provide a certain type of HCBS, they would consider the service costs, health benefits, and sometimes enrollees'

satisfaction. During the transition of the Elderly Waiver HCBS from fee-for-service to managed care for the treatment group, I found minimal change in use of companion services, home-delivered meals, adult day care, and assisted living. A potential explanation is that these services were important to maintain or improve health conditions of the enrollees with potentially lower costs. The decrease in homemaker services billed under the Elderly Waiver HCBS category (newly shifted to managed care) and the increase of the same services billed under the home health HCBS category (already coverage by managed care) may suggest that the managed care plans tried to incorporate new categories of HCBS into their existing HCBS delivery, possibly for lower costs, better care coordination (for example, multiple HCBS being provided by the same provider at a single home visit) and additional health benefits for the enrollees. Non-medical transportation, on the contrary, may have been deemed non-essential for improving health benefits or enrollee satisfaction by the plans, and the costs may have been high; therefore, the plans chose to cut down the provision and intensity of this HCBS benefit.

Various policy implications can be drawn from this study, especially for managed LTSS under Medicaid. First, managed care does not necessarily mean fewer LTSS all across the board. This may be due to nonprofit insurers aiming for both higher profits and quality; or it could be explained by a rationale that stint on some LTSS may result in worsened health conditions of enrollees, which may lead to higher costs in other services covered by managed care plans. Second, this study provides evidence that care coordination and integration may possibly follow when more services are covered by a managed care plan, as potentially supported by the finding on homemaker services in this

chapter. This could and should be a goal for states to expand Medicaid managed care. Third, some services may still be rationed under managed care, such as non-medical transportation in this study. If the managed care plans stint on such services solely due to their higher costs, then Medicaid programs should include additional financial incentives to ensure beneficiaries' access to such services under managed care, especially for the enrollees who would need them the most (for example, older adults who do not have transportation resources at home).

This study has a few notable limitations. First, there was no cost or reimbursement information for managed care claims in the data, preventing cost comparison among different HCBS. Second, there was also no direct quality measures of LTSS in the data; therefore, I was not able to investigate the quality of services directly, although I provided some indirect results on use of hospital and physician services. Third, Medicaid programs vary substantially across states, or even across counties in a state, therefore, applications of the empirical evidence from this chapter to other areas require caution.

1.7. Conclusion

As states start to favor managed care over fee-for-service to deliver Medicaid services, there is a greater need to fill in the current literature gap in the empirical effects of Medicaid managed care on LTSS use. This chapter investigated the effects of providing Medicaid LTSS benefits, especially HCBS, via managed care on older adults' HCBS and hospital and physician services use, by exploiting a Medicaid policy change in Minnesota that shifted more LTSS benefits from fee-for-service to managed care for a group of older

adults. I found that the overall use and intensity of most HCBS did not change for affected enrollees in the seven-county MSP metro area during 2008–2009, with the exception of a decrease in non-medical transportation. However, further investigation is needed to answer questions including if this decrease impeded access to needed LTSS, if alternatives were used as substitutes, or if it had been excessively used under fee-for-service coverage. I also found that homemaker services were more likely to be integrated into home health in managed care. I found limited effects on hospital and physician services use, potentially implying that changes in HCBS did not negatively affect the older adults' health status. Minnesota's experience may offer various policy implications for other states on the issue of expanding Medicaid managed care in LTSS, including that states should consider managed care as an opportunity to improve care coordination in LTSS, especially among different types of HCBS.

Chapter 2. The Effects of Medicaid Managed Care on Nursing Facility (NF) Services for Older Adults: Empirical Evidence from Minnesota, 2008–2009

2.1. Introduction

Long-term services and supports (LTSS) are provided to individuals with functional and cognitive deficiencies, mostly older adults (aged 65 and older) and people with disabilities. Aside from various home and community-based services (HCBS) as previously discussed in Chapter 1, LTSS also include institutional care; older adults generally receive these services in nursing facilities (NFs). Chapter 1 studied the effects of Medicaid managed care on Medicaid older adults' HCBS use, by investigating a Medicaid policy change in Minnesota, which shifted various HCBS from fee-for-service Medicaid to Medicaid managed care for a group of Medicaid older adults in the Minneapolis–St. Paul (MSP) metropolitan area in 2009. The same policy change also included a similar increase in managed care plans' responsibility for NF services: before the policy change, in 2008, the Medicaid-only managed care program, named Minnesota Senior Care (MSC), covered the first 90 days of NF services during the year for community-residing enrollees; after the policy change, in 2009, this program, now named Minnesota Senior Care Plus (MSC+), became responsible for the first 180 days of NF services for community-residing enrollees (Minnesota Department of Human Services 2007; 2008).²⁴ Meanwhile, during both calendar years, the joint Medicare–Medicaid

²⁴ As mentioned earlier, Medicaid older adults in Minnesota are generally required to enroll in managed care; they can either enroll in a default Medicaid-only managed care program, or they can voluntarily enroll in a joint Medicare–Medicaid managed care program (Punelli 2017).

managed care program, named Minnesota Senior Health Options (MSHO), consistently covered the first 180 NF days for community-residing enrollees (Minnesota Department of Human Services 2007; 2008).

This chapter studies the effects of Medicaid managed care on NF services use for Medicaid older adults by investigating the same Medicaid policy change as in Chapter 1. This chapter proceeds as follows. Section 2 describes the study framework, including details of the policy change, the theoretical framework, and hypotheses. Section 3 introduces the study method, including data source, measures, and econometric model specification. Sections 4 describes the results, and Section 5 discusses the results and policy implications. Last, Section 6 provides an overview of the findings and study conclusions.

2.2. Study Framework

2.2.1. Change in Medicaid Managed Care Coverage of NF services

Unlike HCBS, which are generally solely covered by Medicaid for Medicaid older adults, NF services are covered by both Medicare and Medicaid for Medicaid older adults (if eligible for Medicare).²⁵ However, Medicare only covers up to 100 days of short-term post-acute NF services after a three-day inpatient hospital stay, and Medicare-covered NF days need to involve skilled care, which mainly includes nursing and therapy care that

²⁵ Medicare covers some home health services if a doctor certifies that the beneficiary is homebound and needs intermittent skilled nursing care and/or physical/speech-language/occupational therapy; Medicare does not pay for any custodial or personal care if this is the only care the beneficiary needs (Medicare.gov 2020a).

“can only be safely and effectively performed by, or under the supervision of, professionals or technical personnel” (Medicare.gov 2020c). For Medicaid older adults, Medicaid covers their long-term NF services, as well as their cost sharing during Medicare-covered NF days (Medicare.gov 2020b; Medicaid.gov 2020b).

As described in Chapter 1, Minnesota’s Medicaid older adults are generally required to enroll in Medicaid managed care; they can either voluntarily enroll in the joint Medicare–Medicaid managed care program or opt for the default Medicaid-only managed care program. Medicaid managed care and fee-for-service Medicaid have been jointly responsible for Medicaid older adults’ NF services in Minnesota. For non-community-residing (i.e., institutional) Medicaid older adults enrolled in managed care, the fee-for-service program has been paying for all their NF services; for Medicaid older adults residing in the community at enrollment, there was a policy change in the MSP area starting in calendar year 2009 that shifted more NF services from fee-for-service to managed care. For community-residing enrollees, the Medicaid-only managed care program (MSC) covered the first 90 days of NF services in 2008, while this program (now MSC+) started to cover the first 180 days of NF services in 2009; meanwhile, the joint Medicare–Medicaid managed care program (MSHO) consistently covered the first 180 NF days in both calendar years (Minnesota Department of Human Services 2007; 2008).²⁶ It should be noticed that in this case, both post-acute and long-term NF days

²⁶ For each community-residing enrollee, the managed care plans in both programs could get a non-plan-specific NF add-on (which was not contingent on any NF admission) in their monthly capitated payment until the fee-for-service Medicaid program took over the NF services (Minnesota Department of Human Services 2014). As the cap of managed care NF days increased from 90 to 180 for the MSC(+) plans, the NF add-on was also supposed to increase for these plans.

were counted into Medicaid NF days (Minnesota Department of Human Services 2007; 2008). **Exhibit 2-1** shows the corresponding NF coverage in the MSC(+) and MSHO programs during 2008–2009.

As discussed in Chapter 1 and shown in **Exhibit 1-2**, Medicaid managed care capitation rates (paid monthly) were set up in the same way for both MSC(+) and MSHO (Minnesota Department of Human Services 2014). A basic care component applied to both community and institutional Medicaid older adults.²⁷ For all community enrollees, an NF add-on was included until the cap for managed care NF days was reached. For community enrollees receiving the Elderly Waiver HCBS, an Elderly Waiver add-on was also paid (as studied in Chapter 1). Different from the Elderly Waiver add-on, which was conditional on the enrollee having the Elderly Waiver status, the NF add-on was not conditional on an NF admission and was designed to cover risk of NF services use.²⁸

2.2.2. Study Design

In this chapter, I continue to focus on the seven-county MSP metro area during the calendar years 2008–2009, one year before and one year after more NF days were shifted from fee-for-service to managed care for the Medicaid-only managed care program. I use enrollees in the Medicaid-only managed care program (MSC(+)) as the treatment group and those in the joint Medicare–Medicaid managed care program (MSHO) as the comparison group. In the comparison group, there was no change in managed care NF

²⁷ As mentioned in Chapter 1, the basic care component was adjusted for institutional vs. community status, Medicare status, age, and geographic region.

²⁸ As mentioned in Chapter 1, the add-ons were based on recent levels and trends of services use, with adjustments including functional status, age, and geographic region, and they were not plan-specific.

benefits during the study period. I further restrict the study population as those who resided in the community at enrollment (for whom the managed care NF benefits applied) and continuously enrolled in either MSC(+) or MSHO under the same insurer for all 12 months during calendar year 2008, or 2009, or both (for whom the NF benefits were managed by a single plan for an entire year).

This chapter investigates how expanded managed care LTSS affected Medicaid older adults' use of managed care NF service, as well as all (managed care plus fee-for-service) NF services.

2.2.3. Theoretical Framework

The treatment group plans became responsible for more LTSS benefits (all previously covered by fee-for-service) for their enrollees in calendar year 2009 (the post-period) compared to 2008 (the pre-period) in two ways. First, they covered the first 180 NF days for community-residing enrollees instead of the first 90. Second, they also covered an expanded set of HCBS benefits, as discussed in Chapter 1. Meanwhile, there was no change in managed care LTSS benefits for the comparison group plans in the study period; they had already covered the same managed care LTSS benefits (both NF services and HCBS) in the pre-period as those would be covered by the treatment group plans in the post-period.

From a profit-maximizing perspective, it is unclear how managed care NF services use would change for the Medicaid older adults in the treatment group. Previous research has shown that under a prospective payment system, an increase in either average or marginal reimbursement would increase probability of receiving care and intensity of care (Hodgkin and McGuire 1994; Ellis and McGuire 2007; Sood et al.

2013). However, in the context of this study, for each community-residing enrollee, the managed care plans in both the treatment and comparison groups could get an NF add-on, which was not contingent on any NF admission, in their monthly capitated payment until the fee-for-service Medicaid program took over the NF services (Minnesota Department of Human Services 2014). Although the NF add-on, a potential measure of average NF reimbursement for each community-residing enrollee, increased for the treatment group plans as the cap of managed care NF days increased from 90 to 180, it was not contingent on any NF admission and hence different from the average reimbursement in the prospective payment theory. Marginal reimbursement increased during NF days above the first 90 in the post-period for the treatment group plans; however, these plans also became responsible to pay for these additional managed care NF days in the post-period, which was also different from the prospective payment theory assuming the same cost function before and after a policy change.

Another two layers of complexity render how NF services use would change in the treatment group a theoretically unclear question in need of empirical investigation. First, at the same time when the treatment group managed care plans became responsible for more NF services, they also began to cover more HCBS, as discussed in Chapter 1. The plans may have faced complicated incentives to make a decision of LTSS provision between NF services and HBCS, depending on the costs and reimbursements of the two options and the functional needs of the enrollees. For example, for some frail enrollees, the plan may have chosen to provide NF services as long as possible under managed care

and then transfer their NF services to fee-for-service, if the costs of the alternative of providing HCBS to these beneficiaries were too high.²⁹

Second, all insurers in this study were nonprofits; in fact, for-profit insurers had been prohibited from operating as health maintenance organizations in Minnesota for nearly five decades until 2019 (Livingston 2018). Following the theoretical framework proposed in Chapter 1, nonprofit insurers may behave in the range between for-profits maximizing profits and altruists maximizing social welfare; empirical evidence suggests that nonprofit insurers may value both profits and quality (possibly reflected by enrollee satisfaction in some cases) (Pauly et al. 2002; Town, Feldman, and Wholey 2004; Gillies et al. 2006; Long 2008; Chang and Jacobson 2012; Dafny 2019). If the beneficiaries preferred HCBS, or if HCBS could provide better quality of care for the beneficiaries, then the managed care plans were unlikely to intentionally extend their NF stay from this standpoint.

2.3. Methods

2.3.1. Setting and Population

This analysis studied the seven counties in the MSP metro area (Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, Washington) and covered calendar years 2008 and 2009 (24 months). In this area, MSC+ replaced MSC on January 1, 2009. Compared to MSC, MSC+ not only covered more HCBS (as discussed in Chapter 1) but also covered more

²⁹ Notice that there was no cap for any of the HCBS options under managed care coverage.

days of NF services for community enrollees who entered an NF after enrollment (MSC+ covered the first 180 days while MSC only covered the first 90 days).

There were five insurers operating plans in the Medicaid-only managed care program (i.e., MSC(+)) and the joint Medicare–Medicaid managed care program (i.e., MSHO) in this area, and they all participated in both programs in both calendar years. The study population for this analysis included Medicaid older adults (aged 65 and older) who continuously enrolled in either the Medicaid-only managed care program (treatment group) or the joint Medicare–Medicaid managed care program (comparison group) under the same insurer for all the 12 months in 2008 (pre-period) and/or 2009 (post-period). Medicaid older adults who had NF claims that were only paid by fee-for-service Medicaid were considered as non-community (i.e., institutional) enrollees and excluded, since Medicaid managed care was required to pay for the first 90 (MSC) or 180 (MSC+ and MSHO) days of NF services for community enrollees but not any NF services for institutional enrollees.

2.3.2. Data Source

All data were obtained from Minnesota’s Medicaid Management Information System, covering calendar years 2007–2009.³⁰ Information included beneficiaries’ Medicaid enrollment status, demographics, and diagnoses, as well as fee-for-service and managed care encounter claims. Fee-for-service and managed care encounter claims were differentiated by a “pay type” code. Service start and end dates of NF claims were used to calculate durations of NF stays; for a particular beneficiary, multiple NF-related claims

³⁰ Diagnoses from calendar year 2007 were used to calculate a Charlson Comorbidity Index with a 12-month look-back period for each month in the study period (calendar years 2008–2009).

may have overlapped in service dates, although each different date was counted only once for the NF stay durations. All claims, regardless of the status of a “paid code” (allowed, billed, or denied), were used in the analysis, because this code was potentially not valid for managed care encounter claims. This approach may have brought some measurement error in the analysis; however, since many denied claims were due to billing issues (with services having actually been provided) and may have been re-billed later, the error in measuring NF services use introduced by this approach may have been limited.

2.3.3. Measures

To verify that the policy change (i.e., the treatment group managed care plans became responsible for the first 180 NF days for community-residing enrollees instead of the first 90) occurred in the data, I calculated the two following outcomes: (1) a binary variable indicating whether managed care plans paid for NF services after the first 90 NF days; and (2) days of managed care NF services after the first 90 NF days in a year. These measures were only defined for enrollees who (1) had more than 90 NF days during the year; and (2) had managed care NF days early in the year so that the plans could accumulate enough managed care NF days to later transfer the NF services to fee-for-service Medicaid.³¹ According to the policy, the treatment group managed care plans should not have been responsible for paying for any NF services after the first 90 days

³¹ The NF claims identified as early in the year were those in which a beneficiary was admitted into an NF before October 1 for MSC (2008) and July 1 for MSC+ (2009) and MSHO (2008 and 2009). If a beneficiary was admitted into an NF before the corresponding cut-off date, then the insurer could accumulate enough NF days to later transfer NF services to the fee-for-service program (90 managed care NF days for MSC (2008); 180 for MSC(+) (2009) and MSHO (2008 and 2009)).

prior to the policy change but should have after the policy change. The comparison group plans were responsible for the first 180 days of NF services throughout the study period.

The first set of main outcomes measured NF services paid for by Medicaid managed care plans, including (1) a binary outcome indicating any NF services during the year; (2) the number of NF days in a year, not conditional on use of NF services; (3) the number of NF days in a year, conditional on use of NF services; (4) the number of NF days in a year, conditional on beneficiaries having managed care NF claims early in the year (so that the managed care plan could accumulate enough NF days to later transfer NF services to the fee-for-service program).

The second set of main outcomes measured total NF service use, including services paid for by Medicaid managed plans and by fee-for-service Medicaid, which are measured in the same way as those in the first set of main outcomes.

The key explanatory variable was an interaction term between a binary indicator for the treatment group and another binary indicator for the post-period. All regressions controlled for demographic characteristics including age (65–69; 70–74; 75–79; 80–84; 85 and older), gender, race/ethnicity (Asian; Black; Hispanic; multiple; Native; Pacific; White; unknown), marital status (divorced; legally separated; married and living with spouse; never married; married but living separately from spouse; widowed; unknown), and a Charlson Comorbidity Index using a 12-month look-back period for diagnoses.

2.3.4. Statistical Analyses

First, I compared the characteristics of MSC(+) (the treatment group) and MSHO (the comparison group) enrollees in 2008 and 2009, to determine their overall comparability and to identify any differential changes in composition over time.

Next, I performed a descriptive analysis investigating whether the policy change in managed care plans' responsibility for NF coverage was observable in the data. I focused this analysis on managed care plan enrollees with any managed care NF claims early in the year (so that the managed care plan could accumulate enough NF days to later transfer NF services to the fee-for-service program). In each year, I plotted a histogram at the person level that displayed the distribution of NF days paid for by managed care plans across managed care enrollees (and another histogram for all NF days, i.e., NF days paid for by managed care and by fee-for-service). In 2008, I would expect to see most enrollees have under 90 days of managed care NF days. In 2009, I would expect to see most enrollees have under 180 managed care NF days.

Additionally, I also used a difference-in-differences approach to verify that the policy change occurred in the data and focused on these two outcomes: (1) a binary variable indicating whether managed care plans paid for NF services after the first 90 NF days; and (2) days of managed care NF services after the first 90 NF days in a year.³² I would expect to see a positive differential change in both outcomes for the treatment group compared to the comparison group.

Then, I used the same difference-in-differences approach to test whether the outcomes (1) changed within each group; and (2) changed differently between the treatment vs. comparison group after more NF services were shifted to managed care from fee-for-service in the treatment group in the post-period, by estimating a linear

³² As mentioned above, these measures were only defined for enrollees who (1) had more than 90 NF days during the year; and (2) had managed care NF days early in the year so that the plans could accumulate enough managed care NF days to later transfer the NF services to fee-for-service Medicaid.

regression model. Outcomes included measures of NF use paid for by managed care plans and overall (managed care plus fee-for-service). The model is specified as follows:

$$Outcome_{iycp} = \beta Treatment_After_{iyp} + \gamma Enrollee_{iy} + \delta_y + \zeta_c + \eta_p + \varepsilon_{iycp}$$

In the specification, $Outcome_{iycp}$ is the outcome for enrollee i measured in year y who resided in county c and enrolled in managed care plan p (in the Medicaid-only or joint Medicare–Medicaid program). $Treatment_After_{iyp}$ equals to one if enrollee i was in a Medicaid-only managed care plan in the post-period (calendar year 2009) or zero otherwise. $Enrollee_{iy}$ represents a set of enrollee demographics at year y (measured in the first month of the year), including age, gender, race/ethnicity, marital status, and the Charlson Comorbidity Index. δ_y , ζ_c , η_p are year (two years), county (seven counties), plan (one Medicaid-only and one joint Medicaid–Medicaid plan offered by each of the five insurers) fixed effects, respectively. ε_{iycp} is the error term. Standard errors were clustered at the county and insurer interaction level in all estimations.

2.4. Results

Exhibit 2-2 shows the exclusion criteria used to obtain the study population, who were Minnesota Medicaid older adults enrolled in the same managed care program (either MSC(+) or MSHO) and served by the same insurer for all 12 months during the year 2008 and/or 2009 and who were not institutional beneficiaries at enrollment. The main study population includes 3,240 MSC enrollees and 9,384 MSHO enrollees in 2008, as well as 3,572 MSC+ enrollees and 10,403 MSHO enrollees in 2009.

2.4.1. Beneficiary Characteristics

Exhibit 2-3 compares beneficiary characteristics between MSC(+) and MSHO enrollees in the study population in January 2008 and 2009 separately. In January of both years, MSHO beneficiaries were older than MSC beneficiaries (76.41 vs. 75.33 in 2008; 76.26 vs. 75.22 in 2009) on average, and there was a higher proportion of females in MSHO compared to MSC (70.43% vs. 67.28% in 2008; 69.36% vs. 66.27% in 2009). In terms of race/ethnicity, in January of both years, there was higher proportion of Asian, Black and Hispanic beneficiaries and a lower proportion of white ones in MSHO compared to MSC(+).³³ MSHO also had higher proportions of beneficiaries who were divorced or married but living separately from spouse and a lower proportion of beneficiaries married and living with spouse than MSC(+) in January of both years. In January of both years, MSHO beneficiaries had a slightly higher Charlson Comorbidity Index score compared to MSC(+) ones on average (1.19 vs. 1.14 in 2008; 1.26 vs 1.16 in 2009). It should be noticed that while the treatment and comparison groups differed in various beneficiary characteristics, these differences did not change much over time.

2.4.2. Distribution of Yearly NF Days

As also shown in **Exhibit 2-1**, among the study population, the following numbers of beneficiaries had managed care NF services early in the year so that fee-for-service Medicaid may take over their NF benefits later: 209 MSC enrollees and 841 MSHO

³³ Based on a meeting between a team of staff from the Minnesota Department of Human Services and the author on July 17, 2019 in St. Paul, MN, one of the reasons why MSHO had a higher proportion of minority beneficiaries was that MSHO plans made more outreaching efforts in minority communities, including hiring foreign-language speaking case managers.

enrollees in 2008; 153 MSC+ enrollees and 837 MSHO enrollees in 2009.³⁴ For these enrollees, I plotted a histogram for each year at the person level that displayed the distribution of NF days paid for by managed care plans (and another histogram for all NF days, i.e., NF days paid for by managed care and by fee-for-service), to verify that the policy change in managed care plans' responsibility for NF coverage was observable in the data.

Exhibit 2-4 illustrates the distributions of yearly managed care NF days for such beneficiaries in the treatment (MSC(+)) and comparison (MSHO) groups, during the pre-period (2008) vs. post-period (2009). **Exhibit 2-4** provides evidence suggesting that the policy change was observable in the data. In the treatment group, MSC covered the first 90 NF days for community-residing enrollees in 2008, while MSC+ covered the first 180 days in 2009. **Exhibit 2-4(a)** shows that a majority of those MSC enrollees had yearly managed care NF days under 90 days in 2008 and that a majority of those MSC+ enrollees had managed care NF days under 180 days in 2009, both with a local spike at the last 10-day interval below the corresponding cap of managed care NF days.³⁵ In

³⁴ The NF claims considered as early in the year were those in which a beneficiary was admitted into an NF before October 1 for MSC (2008) and July 1 for MSC+ (2009) and MSHO (2008 and 2009). If a beneficiary was admitted into an NF before the corresponding date, then the managed care plan could accumulate enough NF days to later transfer NF benefits to the fee-for-service program (90 managed care NF days for MSC (2008); 180 managed care NF days for MSC+ (2009) and MSHO (2008 and 2009)).

³⁵ One potential reason why some managed care enrollees had yearly managed care NF days exceeding the corresponding threshold based on the claims was that it was not possible to identify if a managed care claim was eventually approved or denied, as mentioned earlier. Therefore, there could have been some NF days in the claims that were denied and not paid.

contrast, **Exhibit 2-4(b)** does not show a similar pattern of change for MSHO enrollees in 2008 vs. 2009, since the policy change did not apply for MSHO (comparison group).

Exhibit 2-5 shows the distribution of total annual NF days (including those paid for by managed care plans and those paid for by fee-for-service Medicaid) for those same enrollees in 2008 vs. 2009, which indicates that there was not much difference in the distribution of total NF days between 2008 and 2009 for either group.

2.4.3. Differential Changes in Outcomes: Managed Care NF Services

Appendix Exhibits 2-1 and 2-2 show the unadjusted means of the outcomes in the treatment and comparison groups in the pre and post-periods. **Exhibits 2-6 & 2-7** show the results from the difference-in-differences model.

The outcomes in **Appendix Exhibit 2-1** and **Exhibit 2-6** were used to again verify that the policy change was observable in the data, since a first step in evaluating this policy change was confirming that the treatment group plans had an increased responsibility to pay for NF days, otherwise we might not expect a change in the provision of NF services. I focused on the beneficiaries who had managed care NF claims early in the year (so that the managed care plan could accumulate enough NF days to later transfer NF services to the fee-for-service program) and who had more than 90 NF days during the year for these outcomes.

Exhibit 2-6 shows that there was an increase in the proportion of beneficiaries whose managed care plan paid for NF services after the first 90 days in the treatment group compared to the comparison group (19.29 percentage points, 95% CI 0.59 to 37.98, $P=0.044$), again providing evidence that managed care plans' financial responsibility for

NF days increased after the policy (although the change in the treatment group alone was not statistically significant; 19.79 percentage points, 95% CI -0.33 to 39.91, P=0.054).

Appendix Exhibit 2-2 and **Exhibit 2-7** include the results for the main outcomes. Despite managed care plans' increased financial responsibility for NF stays, there was no statistically significant change in the treatment group or statistically significant difference in changes between the treatment vs. comparison group, including (1) a binary outcome indicating any NF services during the year; (2) the number of NF days in a year, not conditional on use of NF services; (3) the number of NF days in a year, conditional on individuals receiving NF services; (4) the number of NF days in a year, conditional on beneficiaries having managed care NF claims early in the year (so that the managed care plan could accumulate enough NF days to later transfer NF services to the fee-for-service program). For main outcome (1), however, I did find a statistically significant decrease in terms of the change in the comparison group (-0.98 percentage points, 95% CI -1.76 to -0.19, P=0.017)

2.4.4. Differential Changes in Outcomes: All (Managed Care and Fee-for-Service) NF Services

Appendix Exhibit 2-2 continues to show the unadjusted means of the outcomes in the treatment and comparison groups in the pre and post-periods. Based on the results from the difference-in-differences model as shown in **Exhibit 2-7**, there was no statistically significant change in the treatment group or statistically significant difference in changes between the treatment vs. comparison group for almost all the outcomes, except unconditional yearly days of all (managed care plus fee-for-service) NF services, for which the difference in changes was positive and statistically significant (3.76 days, 95%

CI 0.09 to 7.43, $P=0.045$). Such a difference in changes was mainly driven by a greater decrease in the comparison group (-4.10 days, 95% CI -6.02 to -2.18, $P<0.001$) than in the treatment group (-0.34 days, 95% CI -3.23 to 2.55, $P=0.813$). For the outcome of conditional yearly days of all (managed care plus fee-for-service) NF services, I also found a statistically significant decrease in terms of the change in the comparison group (-15.66 days, 95% CI -22.51 to -8.81, $P<0.001$).

2.5. Discussion

In calendar year 2009, a Medicaid policy change took place in Minnesota, which shifted more LTSS, including both HCBS and NF services, from fee-for-service to managed care for a group of Medicaid older adults in the MSP metro area. This chapter investigated how the additional NF services coverage under managed care affected the NF services use of this group of Medicaid older adults, i.e., those enrolled in the Medicaid-only managed care program (MSC(+)). Although I found some evidence suggesting that such a policy change indeed took place based on NF claims data, I did not find that the affected Medicaid older adults spent more NF days in 2009 compared to 2008.

The other managed care program for Minnesota's Medicaid older adults, the joint Medicare–Medicaid managed care program (MSHO), had no change in managed care LTSS coverage (either HCBS or NF service) during the study period and was used as a comparison group. However, I found statistically significant decreases in terms of any managed care NF use and days of all (managed care plus fee-for-service) NF services in a year (unconditional and conditional) for this group of Medicaid older adults in the post-period compared to the pre-period, all of which were not found for the treatment group. It

turns out that such decreases were consistent with the trend that a smaller and smaller proportion of Minnesota's Medicaid older adults used any NF services in recent years (more details to be discussed in Chapter 3). Further research is needed to investigate why MSHO was a more important driving force of the decline compared to MSC(+) in the metro area during the study period.

This study has a few notable limitations. First, the payment code (approved or denied) was not valid for managed care encounter claims, which could have created problems in calculating the actual NF days paid by managed care (although a denied claim may not necessarily suggest that the services were not provided). Second, there was also no functional measures of the Medicaid older adults in the study, and therefore I was not able to identify the frailty of the enrollees and further locate the group of Medicaid older adults who were most likely to be subject of the unintended consequences. Third, Medicaid programs vary substantially across states, or even across counties in a state, therefore, applications of the empirical evidence from this chapter to other geographical areas require caution.

2.6. Conclusion

Focusing on the same policy change as investigated in Chapter 1, this chapter studies the potential effects of Medicaid managed care on Medicaid older adults' use of NF services, the other important component of LTSS besides HCBS. Although the policy change led to additional coverage of NF services shifted from fee-for-service to managed care for a group of Medicaid older adults in the MSP metro area in 2009, I did not find evidence suggesting that such a policy change brought any change in terms of managed care and

all (managed care plus fee-for-service) NF services use for this group of Medicaid older adults during 2008–2009. The state’s monitoring efforts could have been one of the key factors ensuring that Medicaid older adults were not staying in an NF for an unnecessarily long period. However, I did find that the comparison group (the joint Medicare–Medicaid managed care program, MSHO), which experienced no change in terms of managed care coverage of either HCBS or NF services during the study period, had much larger decreases in NF services use than the treatment group (the Medicaid-only managed care program, MSC(+)). Further research is needed to investigate why MSHO performed a more important role in driving down the proportion of Medicaid older adults who used any NF services in the MSP area during the study period.

Chapter 3. Demographics and Long-Term Services and Supports (LTSS) Use of Medicaid Older Adults in Minnesota, 2005–2017

3.1. Background

The United States is facing an aging population. By 2030, one in every five Americans, equal to 73.1 million, is projected to be aged 65 and older; by 2035, the number of people aged 85 and older is expected to double, reaching 11.8 million (Vespa, Medina, and Armstrong 2020). It is estimated that 70 percent of older adults (aged 65 and older) need long-term services and supports (LTSS) during their lifetime, with those aged 85 and older being five times more likely to need LTSS than those aged 65–74 (Johnson 2019).³⁶

Similar to the national trend, Minnesota’s population is also aging. It is projected that 1.26 million Minnesotans, 21 percent of the state’s population, will be aged 65 and older in 2030 (Minnesota State Demographic Center 2016). Since Medicaid is the nation’s primary payer for LTSS,³⁷ such a demographic change will lead to even higher LTSS expenditures covered by Medicaid. Meanwhile, the new generation of older adults have different expectations for LTSS; they would prefer LTSS to be more person-centered and more fully integrated in the community (Minnesota Department of Human

³⁶ As discussed in previous chapters, long-term services and supports (LTSS) include institutional care (most commonly in nursing facilities (NFs)) and various home and community-based services (HCBS, including home health, personal care, assisted living, adult day care, home modifications, and home-delivered meals, among others). LTSS are provided to individuals with functional and cognitive deficiencies, mostly older adults (aged 65 and older) and people with disabilities.

³⁷ As mentioned in the introduction, Medicaid is and will likely remain the nation’s primary payer for LTSS; in 2017, it spent \$134 billion on LTSS, 57 percent of the nation’s total LTSS spending (Reaves and Musumeci 2015; Hado and Komisar 2019).

Services 2017). As many other states, Minnesota faces dual challenges of managing Medicaid LTSS spending and meanwhile transforming Medicaid LTSS to meet beneficiaries' new expectations. In order to better understand the shifting landscape of Medicaid LTSS population and use as well as better tailor the needs of Medicaid LTSS beneficiaries in Minnesota, it is important to investigate changes and trends in demographics and LTSS use of Minnesota's Medicaid older adults in recent years.

In the previous two chapters, I focused on Medicaid older adults in the Minneapolis–St. Paul (MSP) metropolitan area during calendar years 2008–2009; in this chapter, I broaden my study scope to include Medicaid older adults across the entire state of Minnesota during calendar years 2005–2017. The main study question also shifts away from how Medicaid managed care affected Medicaid older adults' LTSS use and intensity in the MSP metro area to how various aspects of Minnesota's Medicaid older adults changed across the study period, including demographics, Medicare and Medicaid program enrollment, and LTSS and hospital and physician services use.

This chapter proceeds as follows. Section 2 documents the methods, including study setting and population, data source, measures, and statistical analysis. Section 3 describes the results, and then Section 4 discuss the study findings and policy implications. Section 5 concludes this chapter.

3.2. Methods

3.2.1. Setting and Population

The study population included all Medicaid beneficiaries in Minnesota who were aged 65 and older, during calendar years 2005–2017. In each year, more than three fourths of the

study population were enrolled in Medicaid managed care as opposed to fee-for-service Medicaid; however, the following months were excluded due to abruptly and temporarily high proportions of fee-for-service Medicaid beneficiaries among the study population based on the data: April 2013 and January 2015, 2016, and 2017 (**Appendix Exhibit 3-1**).

3.2.2. Data Source

All data were obtained from Minnesota’s Medicaid Management Information System. Information included beneficiaries’ demographics, status of enrollment of Medicare and Medicaid programs, and use of LTSS and hospital and physician services.

3.2.3. Measures

Demographic measures included age, gender, race (Asian, Black, White, others,³⁸ or unknown), marital status (married and living with spouse, not living with spouse,³⁹ or unknown), status of living in the MSP metro area or not, and community or institutional living arrangement (community, assisted living facilities, nursing facilities, or other long-term inpatient facilities⁴⁰).

³⁸ Including Hispanic (ethnicity), multiple, Native, and Pacific. Race/ethnicity is a single variable in the data, and hence it was not possible to identify the race of the Hispanic beneficiaries. It was also possible that not all beneficiaries with a Hispanic ethnicity were identified as “Hispanic” in the data. The proportion of this “others” race category was small during the study period, although it increased from 3.0% in 2005 to 3.9% in 2011 and then to 4.8% in 2017, as shown in **Appendix Exhibit 3-2**. For these reasons, the Hispanic category is not displayed separately in this chapter.

³⁹ Including divorced, legally separated, never married, married but living separately from spouse, and widowed.

⁴⁰ Including intermediate care facilities, long-term care hospitals, and psychiatric inpatient facilities.

Measures of enrollment of Medicare and Medicaid programs were Medicare–Medicaid dual eligibility, enrollment in Medicaid managed care (Minnesota Senior Health Options (MSHO), or Minnesota Senior Care (Plus) (MSC(+)) or fee-for-service Medicaid, Medicaid waiver recipient status (no waiver, the Elderly Waiver, or other waivers, including those for beneficiaries with developmental disability or brain injury). Please refer to Chapter 1 for details about MSHO, MSC(+), and the Elderly Waiver.

Multiple measures of use of hospital and physician services and LTSS were also included. Use of LTSS was first categorized into four mutually exclusive groups: (1) no LTSS, (2) home and community-based services (HCBS) only, (3) nursing facility (NF) services only, or (4) both HCBS and NF services. Then, use of different types of HCBS was further examined, covering home health, personal care, companion services, home-delivered meals, homemaker services, adult day care, assisted living, and non-medical transportation (a beneficiary could use several types of HCBS simultaneously).

All demographic and Medicare and Medicaid program enrollment measures, except age, were calculated as a proportion (in percentage) among all study population in each calendar year, weighted by each individual beneficiary’s Medicaid enrollment months during the corresponding calendar year. Age was measured as the mean among all study population in each calendar year, weighted in the same way.

All measures of use of hospital and physician services and LTSS were calculated as a proportion (in percentage) of beneficiaries who used the corresponding service at least once during each calendar year among all study population.

3.2.4. Statistical Analyses

First, I calculated the values of all the measures for the full study population in each year during 2005–2007. Second, I stratified the study population in three ways (as described below) and calculated the values for measures of use of hospital and physician services and LTSS among each sub-group in each year. I first stratified based on age (ages 65 to 74, ages 75 to 84, or ages 85 and older), then on the status of living in the MSP metro area or not,⁴¹ and last on Medicaid managed care enrollment status (MSHO, MSC(+), or not enrolled in managed care (i.e. fee-for-service)).

3.3. Results

3.3.1. All Population

The number of Medicaid older adults (aged 65 and older) in Minnesota increased from 64,835 in 2005 to 68,389 in 2011 and then to 78,625 in 2017 (Appendix **Exhibit 3-2**).

3.3.1.1. Demographics

Exhibit 3-1 shows demographic trends of the entire study population during the study period (2005–2017), the underlying numbers for which are included in **Appendix Exhibit 3-2**.

The average age of Minnesota’s Medicaid older adults decreased across the years, from 79.6 in 2005 to 79.1 in 2011 and then to 77.1 in 2017. The decrease was expedited starting in 2011, as show in **Exhibit 3-1(a)**. The proportion of female beneficiaries

⁴¹ I also conducted a sensitivity analysis, where I further stratified the non-metro beneficiaries into those who lived in Minnesota’s micropolitan counties and those who did not. The micropolitan counties included St. Louis county in the Duluth area; Stearns, Sherburne, and Benton counties in the St. Cloud area; and Olmsted county in the Rochester area (APM Research Lab 2018).

decreased steadily during the study period, from 71.9% in 2005 to 69.4% in 2011 and then to 66.1% in 2017. During the study period, there was an increase in racial diversity of the study population, represented by increases in the proportions of beneficiaries identified as Asian, Black, and of other races and a decrease in the proportion of White beneficiaries, as shown in **Exhibit 3-1(c)**. White beneficiaries made up 81.5% of the study population in 2005 but only 75.5% in 2011 and subsequently 68.6% in 2017. Beneficiaries not living with a spouse (including those divorced, legally separated, never married, married but living separately from spouse, and widowed) made up most of the study population during the years as opposed to those married and living with spouse, but this percentage decreased over the study period, from 94.7% in 2005 to 90.3% in 2011 and then to 82.1% in 2017. The proportion of beneficiaries residing in the MSP metro area increased across the years, from 46.6% in 2005 to 50.7% in 2011 and then to 55.5% in 2017. Last, more of Minnesota's Medicaid older adults lived in the community (57.4% in 2005; 62.8% in 2011; 71.0% in 2017), and meanwhile, substantially fewer lived in nursing facilities (34.5% in 2005; 25.2% in 2011; 17.6% in 2017). The proportion of beneficiaries living in assisted living facilities increased early in the study period but plateaued after 2009, as illustrated in **Exhibit 3-1(f)**.

3.3.1.2. Enrollment of Medicare and Medicaid Programs

Exhibit 3-2 shows trends in the measures for enrollment of Medicare and Medicaid programs of the entire study population during the study period (2005–2017), the underlying numbers for which are also included in **Appendix Exhibit 3-2**.

A majority of the study population were also eligible for Medicare (Medicare–Medicaid dually eligible), although the proportion decreased from 96.2% in 2005 to

95.8% in 2011 and then 92.3% in 2017. The decrease was most salient during 2013–2015, as shown in **Exhibit 3-2(a)**. Medicaid older adults (aged 65 and above) not eligible for Medicare could include those who had disabilities and were unable to navigate the complex application process and those who had immigrated from foreign countries.⁴² More than 75% of the study population enrolled in Medicaid managed care in each year of the study period, as managed care was required for most Medicaid older adults in Minnesota, with a few exceptions including individuals with medical spenddowns or terminal illness (Punelli 2017; Minnesota Department of Human Services 2007; 2008). Minnesota’s Medicaid older adults can voluntarily enroll in Minnesota Senior Health Options (MSHO), a joint Medicare–Medicaid managed care plan; if not, they are required to enroll in Minnesota Senior Care Plus (MSC+; named as Minnesota Senior Care (MSC) in all or some counties before 2009), which is a Medicaid-only managed care plan (Minnesota Department of Human Services 2008; Punelli 2017). As shown in **Exhibit 3-2(c)**, there was a massive spike in the proportion of beneficiaries enrolled in MSHO from 2005 (13.2%) to 2006 (62.4%), accompanied by a sharp drop in the proportion of MSC(+) (from 62.4% to 16.4%). This was due to many MSC(+) older adults getting passively enrolled in MSHO at the beginning of 2006, when the Centers for Medicare and Medicaid Services (CMS) granted a one-time passive enrollment opportunity with the start of Medicare Part D prescription drug coverage (Minnesota Department of Human Services 2006). The uptick of MSHO at the beginning of 2006 largely remained for the next few years, although the proportion of MSHO enrollees among the study

⁴² Based on information from a team of staff of the Minnesota Department of Human Services, during a meeting between the staff and the author on July 17, 2019 in St. Paul, MN.

population decreased during 2011–2015 (from 63.1% to 54.9%). The proportion of MSC+ enrollees increased to 19.1% in 2007 and then to 20.2% in 2011 and later to 27.3% in 2017. During 2005–2011, the proportion of beneficiaries granted with the Elderly Waiver, which opens the door to more HCBS options such as home-delivered meals and assisted living, increased from 25.6% to 38.7%, although it stayed relatively flat after 2011.

3.3.1.3. Use of Hospital and Physician Services and LTSS (Including Various HCBS)

Exhibit 3-3 shows trends in the use measures of hospital and physician services and LTSS of the entire study population during the study period (2005–2017), with the underlying numbers included in **Appendix Exhibit 3-2** as well.

The proportion of beneficiaries who had any inpatient hospital services during the year decreased during 2011–2015, from 23.3% to 19.0%, but rebounded to 20.0% in 2017. The proportion for outpatient hospital services increased during 2008–2014, from 41.3% to 52.3%, but decreased to 50.4% in 2017. The proportion for physician services jumped between 2005 and 2006, from 79.7% to 84.3% and stayed high ever since, although there was a decrease during 2014–2017, from 86.4% to 83.2%.

In terms of LTSS use, as shown in **Exhibit 3-3(b)**, the proportion of beneficiaries not getting any LTSS during the year first decreased and later increase during the study period, from 42.9% in 2005 to 38.8% in 2011 and then to 46.3% in 2017. As for those who got LTSS during the year, the proportion of beneficiaries getting HCBS only increased from 33.1% in 2005 to 45.6% in 2011 and then more slowly to 46.4% in 2017; the proportion of those getting NF services only decreased throughout the years, from

41.3% in 2005 to 32.2% in 2011 and then to 23.5% in 2017. Note that NF services may include short-term post-acute care, which could not be appropriately separated from NF long-term care in the data. For a closer look at the specific types of HCBS used, among the study population, the proportion of beneficiaries receiving any home health services during the year fluctuated in the study period, from 19.2% in 2005 to 23.5% in 2011 and then to 19.8% in 2017; the proportion of those getting any personal care increased from 7.4% in 2005 to 11.7% in 2011 and then to 14.4% in 2017. The Elderly Waiver provides other HCBS options to Minnesota's Medicaid older adults, the trends in the most frequently used ones are shown in **Exhibit 3-3(d)**. Across 2005–2017, the proportions of beneficiaries using any of the following services during the year generally increased: assisted living (from 10.7% in 2005 to 16.4% in 2011 and 2017), homemaker (from 11.1% in 2005 to 13.1% in 2011 to 13.9% in 2017), non-medical transportation (from 1.7% in 2005 to 6.4% in 2011 and then to 8.8 in 2017), and adult day care (from 2.5% in 2005 to 5.3% in 2011 and then to 7.0% in 2017). The proportion for use of home-delivered meals increased from 8.9% in 2005 to 9.8 in 2011 but later decreased to 8.2% in 2017.

3.3.2. Use of Hospital and Physician Services and LTSS of Stratified

Populations

3.3.2.1. Population Stratified by Age Group

When the study population was stratified into three age groups, the numbers of beneficiaries in 2005 were 22,180 for ages 65 to 74, 23,139 for ages 75 to 84, and 22,907 for ages 85 and older. In 2011, the numbers were 25,109, 20,300, and 22,980 respectively. In 2017, the numbers were 36,606, 21,512, and 20,507 respectively.

Exhibit 3-4 shows trends in the use measures of hospital and physician services and LTSS of the study population stratified into the three age groups, with the underlying numbers included in **Appendix Exhibit 3-3**.

The trends in hospital and physician services use were similar across the three age groups; the older the beneficiaries were, the less likely they used any outpatient hospital services during the year in each year of the study period. The trends in the proportions of beneficiaries who used no LTSS and who used NF services only stayed similar across the age groups; in each year, the younger the beneficiaries were, the more likely they used no LTSS during the year, and the less likely they used NF services. As illustrated in **Exhibit 3-4(b)**, the proportion of beneficiaries who used HCBS only increased throughout the study period for the two older age groups, while for the youngest age group, it increased from 32.5% in 2005 to 42.2% in 2011 but later decreased to 37.8% in 2017.

The younger age groups, those aged 65 to 74 and those aged 75 to 84, are likely to be the main driver of Minnesota's Medicaid LTSS expenditures in the near future as they age older. **Appendix Exhibit 3-4** shows the demographics and Medicare–Medicaid dual-eligibility of the study population stratified by age groups, suggesting that the group of older adults aged 75 to 84 was driving the entire study population's recent trends in lower proportion of White beneficiaries, higher proportion of beneficiaries married and living with spouse, higher proportion of beneficiaries living in the metro area, and higher proportion of beneficiaries living in the community; meanwhile, the youngest group was driving the entire study population's recent trend in lower Medicare–Medicaid eligibility.

3.3.2.2. Population Stratified by Status of Living in the MSP Metro Area

In 2005, there were 30,058 Medicaid older adults who lived in the MSP metro area and 34,792 who did not. In 2011, the numbers were 34,112 and 34,319 respectively. In 2017, the numbers were 42,833 and 35,805 respectively.

Exhibit 3-5 shows trends in the use measures of hospital and physician services and LTSS of the study population stratified by status of living in the MSP metro area or not, with the underlying numbers included in **Appendix Exhibit 3-5**.

The trends in hospital and physician services use were similar across the two groups; beneficiaries living in the metro area were less likely to use any outpatient hospital services during the year in each year of the study period. The trends in the four mutually exclusive LTSS use categories were all similar between the two groups. Medicaid older adults in the metro area were more likely to use no LTSS or use HCBS only and less likely to use NF services only or both HCBS and NF services.

As a sensitivity analysis, I further stratified the non-metro beneficiaries into those who lived in Minnesota's micropolitan counties and those who did not. The micropolitan counties included St. Louis county in the Duluth area; Stearns, Sherburne, and Benton counties in the St. Cloud area; and Olmsted county in the Rochester area (APM Research Lab 2018). **Appendix Exhibit 3-6** shows trends in the use of hospital and physician services and LTSS of the study population stratified by metro vs. micro vs. rural living status. The trends were generally similar between the metro and micro counties, except that the proportions of (1) beneficiaries who only used HCBS and (2) beneficiaries who only used NF services among the micro beneficiaries started similar to those among the metro beneficiaries but later grew closer to those among the rural beneficiaries.

3.3.2.3. Population Stratified by Status of Medicaid Managed Care Enrollment

In 2005, there were 13,091 Medicaid older adults enrolled in the Joint Medicare–Medicaid managed care program of MSHO, 42,770 enrolled in the Medicaid stand-alone managed care program of MSC(+), and 28,756 enrolled in fee-for-service Medicaid. In 2011, the numbers for the three groups were 42,959, 16,216, and 20,903, respectively. In 2017, the numbers were 44,192, 25,030, and 23,863, respectively.

Exhibit 3-6 shows trends in the use measures of hospital and physician services and LTSS of the three groups, and the underlying numbers are included in **Appendix Exhibit 3-8**.

The trends in hospital and physician services use were similar across the three groups; fee-for-service beneficiaries were less likely to use any of these services during the year in each year of the study period. Compared to MSC(+) enrollees, MSHO enrollees were more likely to use hospital and physician services. Although the proportions of beneficiaries utilizing no LTSS during the year were similar among the three groups, it diverged later in the study period with a decrease for fee-for-service beneficiaries and increases for managed care ones, as shown in **Exhibit 3-6(b)**. The proportion for HCBS use only stayed relatively flat for fee-for-service beneficiaries, increased for MSHO enrollees, and first increased and later decreased for MSC(+) enrollees. The decreasing trends in NF use only were similar for the three groups.

3.3.3. Use of Various HCBS of Stratified Populations

3.3.3.1. Population Stratified by Age Group

Exhibit 3-7 presents trends in the use measures of various types of HCBS of the study population stratified into the three age groups, with the underlying numbers included in **Appendix Exhibit 3-3**.

The trends in home health use were similar between the two older groups, although beneficiaries of ages 75 to 84 were more likely to use any home health during the year than those of ages 85 and older. The youngest group had similar use proportion with the middle group at the beginning of the study period but later diverged and declined to the level of the oldest group at the end of the period. Although the proportion for personal care increased for all three groups early in the study period, the proportion plateaued with a small decline for the youngest group later but kept increasing for the two older groups. In terms of the Elderly Waiver HCBS options, the trends were generally similar for all three groups in terms of companion and home-delivered meals. The middle group experienced faster growth in homemaker, adult day care, and non-medical transportation, while the oldest group saw the proportion for assisted living use more than doubled from 14.8% in 2005 to 30.5% in 2017. For the youngest group, the proportions for home-delivered meals, homemaker, adult day care, and non-medical transportation all decreased in the late stage of the study period.

3.3.3.2. Population Stratified by Status of Living in the MSP Metro Area

Exhibit 3-8 presents trends in the use measures of various types of HCBS of the study population stratified into those living in the MSP metro area and those not, with the underlying numbers included in **Appendix Exhibit 3-5**.

The trends were similar for the two groups in home health, and the proportion for personal care grew faster for those living in the metro area. In terms of the Elderly Waiver HCBS options, the trends were generally similar for the two groups in terms of companion and home-delivered meals. Beneficiaries living in the metro area surpassed those not in the middle of the study period in use of homemaker services. Beneficiaries living in the metro area experienced faster growth in adult day care and non-medical transportation throughout the study period, while those not living in the metro area saw faster growth in assisted living during 2007–2014.

Appendix Exhibit 3-7 shows results from the sensitivity analysis, which are trends in the use of various HCBS of the study population stratified by metro vs. micro vs. rural living status. The trends of the micro beneficiaries were generally in between those of the metro and rural sub-groups for most HCBS, except that the micro beneficiaries followed their rural counterparts more closely in the use of homemaker services, adult day care, and assisted living.

3.3.3.3. Population Stratified by Status of Medicaid Managed Care Enrollment

Exhibit 3-9 shows trends in the use measures of various types of HCBS of the study population stratified into groups of enrollment in Medicaid managed care (MSHO and MSC(+)) and fee-for-service Medicaid, with the underlying numbers included in

Appendix Exhibit 3-6.

The proportion for home health increased for MSHO enrollees but decreased for fee-for-service beneficiaries; for MSC(+) enrollees, it first increased and later decreased. The proportion for personal care increased for the managed care beneficiaries but not the

fee-for-service ones. As for the Elder Waiver HCBS options, home-delivered meals stayed relatively flat for MSHO enrollees while decreased for the other two groups across the years. The proportions for homemaker, adult day care, assisted living, and non-medical transportation all increased for MSHO enrollees. For MSC(+) enrollees, the proportions for adult day care and non-medical transportation increased early in the study period but have plateaued with slight decrease after 2010; the proportion for assisted living first increased and then decreased. For fee-for-service beneficiaries, the proportions for assisted living and non-medical transportation increased but that for homemaker decreased.

3.4. Discussion

During the period 2005–2017, the number of Medicaid older adults in Minnesota increased by 21.3%, reaching to 78,625 in 2017 from 64,835 in 2005; meanwhile, the demographics of Minnesota’s Medicaid older adults went through transformational changes: on average, they became younger, less likely to be female, less likely to be white, more likely to be married and living with spouse, more likely to reside in the MSP metro area, and more likely to live in the community. These findings suggest (1) that on average, Minnesota’s Medicaid older adults potentially became healthier and had more family recourses to help them stay in the community; and (2) that they were diverse based on race and ethnicity but were more concentrated in the metro area.

In terms of their enrollment in Medicare and Medicaid programs, on average, they were less likely to be Medicare–Medicaid dual-eligible in recent years (a trend mainly driven by the youngest age group), although the level remained high (well above 90%).

The main reasons for such a decrease in recent years remain unclear, and data quality issue cannot be ruled out as a potential explanation. While the proportion of Medicaid older adults enrolled in managed care stayed relatively stable during this period (between 75%–85%) due to generally mandatory managed care enrollment, a lower proportion of beneficiaries voluntarily enrolled in the joint Medicare–Medicaid managed care plan (MSHO) and a higher proportion of beneficiaries enrolled in the default Medicaid-only managed care plan (MSC+) in recent years. Reasons for beneficiaries not voluntarily opting for MSHO may include them being satisfied with their current Medicare Part D plans and hesitant to change, as well as some Medicaid older adults not being aware of MSHO due to insufficient knowledge about Medicare;⁴³ besides, this may have also been related to the influx of non-Medicare-eligible immigrants in recent years. Still, there were twice as many beneficiaries enrolled in MSHO as those enrolled in MSC+ in 2017. Although a higher proportion of Medicaid older adults lived in the community, the proportion of beneficiaries who received the Elderly Waiver, which would grant Medicaid older adults who would need NF level care access to a broader set of HCBS, remained relatively flat during more recent years; however, the findings below on their LTSS use could help explain this.

In terms of hospital and physician services use, more hospital services are transferred from the inpatient to outpatient setting, compatible with Medicare’s national trend (Medicare Payment Advisory Commission 2019). Use of physician services was relatively stable across the study period.

⁴³ Based on information from a team of staff of the Minnesota Department of Human Services, during a meeting between the staff and the author on July 17, 2019 in St. Paul, MN.

During the study period, the proportion of Medicaid older adults who used no LTSS during the year first decreased but later increased in more recent years, which could be related to the younger average age and better health conditions of the population. The proportion of Medicaid older adults who used NF services but not HCBS kept decreasing during the study period, especially for the older adults aged 85 and older, which could reflect the success of Minnesota’s efforts to rebalancing Medicaid LTSS from NF services to HCBS, including programs helping transition people from institutional settings back to their homes. In federal fiscal year 2016, Minnesota spent 76% of Medicaid LTSS expenditures on HCBS, the third highest number across the nation (Kane, Priester, and Kane 2008; Minnesota Department of Human Services 2017; Eiken et al. 2018).⁴⁴ It is also projected that, in 2030, the number of Minnesota’s Medicaid older adults using HCBS will increase to 75,000 (a 104% growth from 2015), and the state’s Medicaid program will spend \$739 million for their HCBS (a 99% growth from 2015) (Blewett, Alarcon, and Hest 2018). However, the proportion of Medicaid older adults who used HCBS as the only LTSS remained relatively flat during more recent years in this analysis, which was also reflected in the relatively stable proportion of Medicaid older adults with the Elderly Waiver; this trend could be explained by the recently growing proportion of younger and healthier (especially those aged 65–74) Medicaid older adults who would not need any LTSS. It should also be noticed that the

⁴⁴ Across the nation, Medicaid’s LTSS expenditures have been continuously shifting from institutional care to HCBS; for all Medicaid LTSS populations, in fiscal year 2013, Medicaid’s LTSS expenditures on HCBS surpassed those on institutional care for the first time, and the gap increased further in later fiscal years (Eiken et al. 2018).

decrease in this proportion was also driven by MSC+ (the Medicaid-only managed care program) enrollees, potentially including those non-Medicare-eligible new immigrants, although it remains unclear if these immigrants were younger and healthier compared to the rest of Medicaid older adults.

In terms of use of different types of HCBS, there has been an increase in personal care, covered outside of the Elderly Waiver, as well as assisted living, homemaker services, adult day care, and non-medical transportation covered under the Elderly Waiver. Meanwhile, home-delivered meals, despite also being covered by the Elderly Waiver, experienced a decrease in use. The younger, metro-living, and managed-care-enrolled sub-groups, in particular, drove the increases in personal care, homemaker services, adult day care, and non-medical transportation; while the oldest and non-metro-living sub-groups played a larger role in the increase in assisted living.

These changes in the use of LTSS among Minnesota's Medicaid older adults coincide with changes in the supply of LTSS within the state. In Minnesota, the total number of certified NF beds for Medicare and Medicaid beneficiaries decreased from 32,728 in 2009 to 30,843 in 2012 and then to 29,285 in 2016 (Harrington et al. 2018). On the contrary, Minnesota's number of "housing-with-services" providers (a category of senior housing that includes assisted living) more than doubled between 2005 and 2015, reaching above 2,000 in 2015 (Davies 2015). It should also be noticed that as more LTSS are provided as HCBS for Medicaid older adults, the state is facing a workforce shortage, and providers are struggling with issues of recruitment and retention (Minnesota Department of Human Services 2017).

According to the 2015 Survey of Older Minnesotans, when asked what they would most likely do if being no longer able to live independently for health reasons, 29 percent of people aged 65 and older chose moving to assisted living and another 20 percent opted for staying in their home with an agency providing care, suggesting that people were aware of and preferred access to less restrictive options of HCBS rather than staying in an NF (Minnesota Department of Human Services 2017). However, while assisted living is becoming a desirable alternative to NFs, Medicaid does not cover room and board charges in an assisted living facility as per the statute, and this is the case in Minnesota (Government Accountability Office 2018; Minnesota Department of Human Services 2020). Without additional financial support for housing, Medicaid LTSS recipients may have difficulties in finding an open and affordable assisted living spot, which may in fact lead them to an NF, at greater financial expenses of Medicaid (Minnesota Board on Aging 2013). The state may consider providing additional room and board subsidies for assisted living to Medicaid older adults, especially for those living in the metro area (where the room and board fares are supposed to be higher), although currently lower-income older adults at risk of being institutional or becoming homeless can receive financial assistance for housing through the Housing Support program, which is not a Medicaid program (Minnesota Department of Human Services 2018b).

Social determinants of health, including factors such as housing (discussed above), food, and transportation, have received growing policy attention in recent years; in Minnesota's "Reform 2020" initiative for Medicaid, recognizing and addressing the need and cost of social determinants of health care was considered as a sub-goal, with

great relevance to LTSS (Minnesota Department of Human Services 2017). The trend of a decrease in home-delivered meals for Medicaid older adults during recent years is worrying, as nationally about 13 percent of older adults and people with disabilities reported to have ever skipped a meal due to financial worries in 2016 (Minnesota Department of Human Services 2017). The state should spend more efforts ensuring Medicaid older adults have access to appropriate and nutritionally balanced meals delivered to their homes if needed. Although I found a relative decrease in use of non-medical transportation in Chapter 1, which gives Medicaid older adults access to waiver and community resources and activities, for MSC(+) enrollees compared to MSHO enrollees in the metro area between 2008 and 2009, its use actually increased among all Medicaid older adults in Minnesota during 2005–2017, thus alleviating concerns about its under-provision under managed care. However, it should be noticed that the increase in use of non-medical transportation was still driven more by the MSHO, rather than the MSC+, program, which could be related to the fact that on average, MSHO enrollees are more likely to use the Elderly Waiver HCBS. Additionally, the increase in use of non-medical transportation was more salient in the metro area compared to the non-metro area, raising new concerns about its under-provision in the non-metro areas across the state. The state may need to further evaluate if non-metro-living Medicaid older adults' non-medical transportation needs are diligently met, especially as transportation was the most often cited service gap for older adults by the state's HCBS stakeholders in 2017 (Minnesota Department of Human Services 2017). If not, then the state may consider strategies such as increasing reimbursement and expanding non-medical transportation service provider network.

3.5. Conclusion

As in other states of the nation, Minnesota's population is aging, and the demand for LTSS is growing. As the primary payer of LTSS, the state Medicaid program is facing dual goals of managing LTSS spending while catering to changing demographics and preferences of the LTSS population. The efforts of rebalancing Medicaid LTSS expenditures from NF services to HCBS may simultaneously satisfy both goals, since HCBS generally cost less than NF services, and the new generation of LTSS population has a stronger preference of aging in the community or at home. Also, HCBS may better cater to the needs of LTSS beneficiaries from different backgrounds since they are provided within the beneficiaries' own community and home. Minnesota's rebalancing efforts have been successful compared to other states, but the state still faces new challenges in transforming LTSS and especially HCBS provision to better align with the beneficiaries' needs. Based on the findings in this chapter, the state needs to pay special policy attention to ensuring access to assisted living, home-delivered meals, and non-medical transportation, which all lie within the spectrum of social determinants of health.

Summary

The United States is facing an aging population and a growing need for long-term services and supports (LTSS). Medicaid is the nation's primary payer for LTSS, and states increasingly favor Medicaid managed care to provide LTSS as opposed to the traditional fee-for-service approach. With capitated payments, managed care plans may have financial incentives to provide LTSS more efficiently, but they may also face pressure to reduce costs, which could lead to under-provision of services, with potential adverse impacts on beneficiaries' health.

My dissertation fills the literature gap in the effects of Medicaid managed care on LTSS use, by investigating a Medicaid policy change in Minnesota which shifted more LTSS from fee-for-service to managed care for a group older adults (aged 65 and older) in the Minneapolis–St. Paul metro area during 2008–2009. In use of home and community-based services (HCBS), I found that overall use and intensity of most HCBS did not change for the affected enrollees, with the exception of a decrease in non-medical transportation. I also found that homemaker services were more likely to be integrated into home health after the policy change. In use of nursing facility (NF) services, I found limited changes. In addition, I found no effect on use of hospital and physician services, potentially implying that changes in HCBS did not adversely affect health status in ways that would increase health care use. The state's monitoring efforts to ensure care quality may have been a key contributor to the relatively limited effects of Medicaid managed care LTSS coverage change on Medicaid older adults' LTSS use in this case. Meanwhile, Minnesota's experience may also indicate that other states should consider managed care

as an opportunity to improve care coordination in LTSS, especially among different types of HCBS.

Later in my dissertation, I broadened my research scope to the entire state of Minnesota during 2005–2017 to investigate changes in Medicaid older adults' demographics and LTSS use. The findings suggest that the Medicaid enrollees in Minnesota are increasingly diverse in terms of race and ethnicity and that enrollees have strong preferences to age at home or in the community. Based on my findings, the state should pay special attention to ensure provision of HCBS that relate to social determinants of health, such as housing, food, and transportation.

Exhibits

Exhibit 1-1. Home and Community-Based Services (HCBS) Coverage in Minnesota’s Medicaid Program for Older Adults (Aged 65 and Older), 2008–2009

Program	2008 (Pre-Period)	2009 (Post-Period)
Minnesota Senior Care (Plus) (MSC(+), the Medicaid-only managed care program; treatment group)	Fee-for-service: - Elderly Waiver services Managed care: - Home health - Personal care	Fee-for-service: None Managed care: - Home health - Personal care - Elderly Waiver services
Minnesota Senior Health Options (MSHO, the joint Medicare–Medicaid managed care program; comparison group)	Fee-for-service: None Managed care: - Home health - Personal care - Elderly Waiver services	

Notes:

(1) Based on 2008–2009 claims, the most commonly used Elderly Waiver HCBS included companion services, home-delivered meals, homemaker services, adult day care, assisted living (formally referred as “customized living” in Minnesota), and non-medical transportation. Other Elderly Waiver HCBS included case management (which was also supposed to be widely used but managed care plans did not always submit claims for this service), chore services, consumer directed community supports, environmental accessibility adaptations, extended home health services, extended personal care assistance, family caregiver services, foster care, and transitional services.

(2) In terms of nursing facility (NF) benefits, MSC covered the first 90 NF days for community-residing enrollees (in the pre-period), MSC+ covered the first 180 days (in the post-period), while MSHO covered the first 180 days in both the pre and post-periods. Chapter 2 further investigates the effects of managed care on NF services.

Exhibit 1-2. Minnesota's Medicaid Managed Care Capitation Rates for Older Adults

Group of Medicaid Older Adults	Medicaid Managed Care Capitation Rates for MSC(+) & MSHO		
	Basic Care Component	Elderly Waiver Add-on	NF Add-on
Institutional	Yes		
Community w/o the Elderly Waiver	Yes		Yes
Community w/ the Elderly Waiver	Yes	Yes	Yes

Exhibit 1-3. Study Population

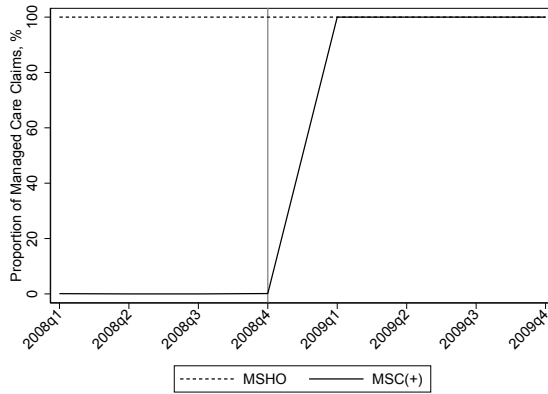
Population	Number of Medicaid older adults in the Seven-County MSP Metro Area									
	Insurer #1	Insurer #2	Insurer #3	Insurer #4	Insurer #5	Insurer #1	Insurer #2	Insurer #3	Insurer #4	Insurer #5
Restricted to beneficiaries who received HCBS for 12 months in 2008	No					Yes				
[1] Beneficiaries enrolled in managed care for 24 months during 2008–2009	13,972					5,590				
[2] Among [1], Beneficiaries enrolled in managed care and served by the same insurer for 24 months during 2008–2009 ([2]=[3]+[4]+[5])	13,244					5,262				
[3] Among [2], Beneficiaries enrolled in MSC(+) and served by the insurer for 24 months during 2008–2009 (treatment group)	1,589	233	430	215	156	902	105	139	61	68
[4] Among [2], Beneficiaries enrolled in MSHO and served by the same insurer for 24 months during 2008–2009 (comparison group)	3,236	3,206	1,634	571	831	1,096	1,375	603	173	411
[5] Among [2], Beneficiaries who switched between MSC(+) and MSHO but were served by the insurer for 24 months during 2008–2009	511	386	191	27	28	121	138	45	11	14

Exhibit 1-4. Baseline Beneficiary Characteristics in Treatment (MSC(+)) vs. Comparison (MSHO) Group, January 2008

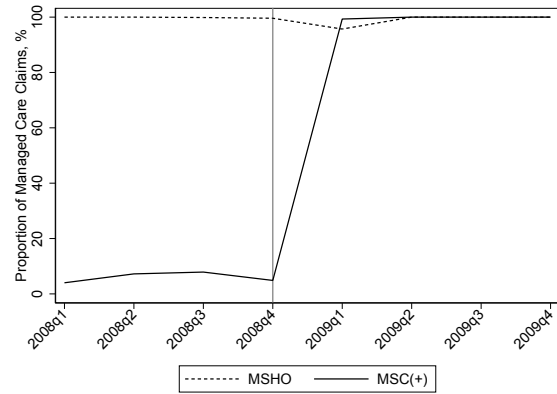
Beneficiary Characteristic	MSC(+) Beneficiaries (Treatment Group) [N=1,275]	MSHO Beneficiaries (Comparison Group) [N=3,658]	P-Value for Difference
Age, mean (SD), years	77.46 (7.53)	77.16 (7.51)	0.541
Female, %	72.08	73.59	0.515
Race/ethnicity:			
Asian, %	6.04	31.63	<0.001
Black, %	7.45	16.89	0.066
Hispanic, %	0.31	1.86	<0.001
Multiple, %	0.00	0.05	0.118
Native, %	0.55	0.87	0.451
Pacific, %	0.08	0.03	0.527
Unknown, %	1.18	0.90	0.421
White, %	84.39	47.76	<0.001
Marital status:			
Divorced, %	12.78	18.62	0.006
Legally separated, %	0.24	0.41	0.130
Married, living with spouse, %	20.55	8.45	0.025
Married, living separately from spouse, %	12.24	18.70	0.004
Never married, %	8.08	11.59	0.031
Unknown, %	0.08	0.05	0.795
Widowed, %	46.04	42.18	0.115
Charlson Comorbidity Index, mean (SD)	1.34 (1.61)	1.29 (1.56)	0.456

Note: Standard errors clustered at the county and insurer interaction level (32 clusters).

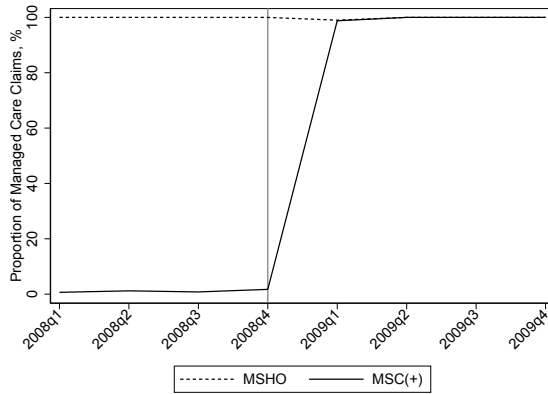
Exhibit 1-5. Changes in Proportions of Managed Care Claims for the Most Common Elderly Waiver HCBS in Treatment (MSC(+)) vs. Comparison (MSHO) Group, 2008–2009



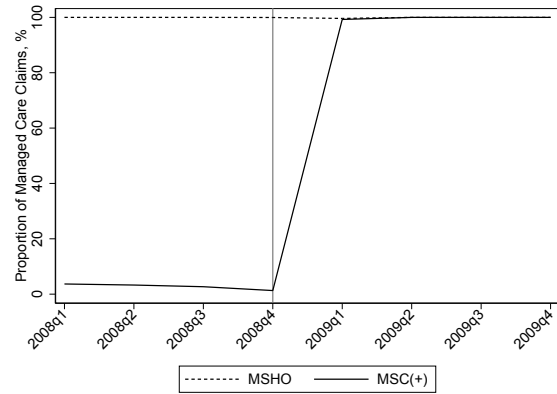
(a) Companion Services



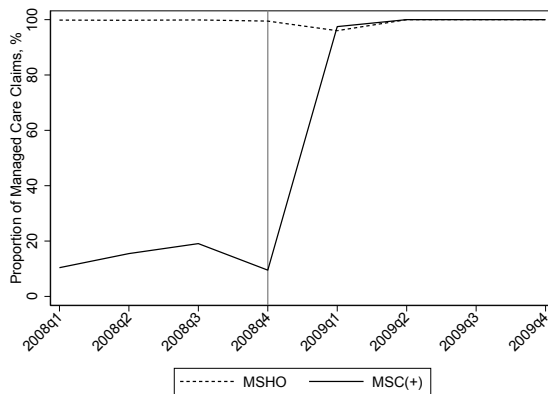
(b) Home-Delivered Meals



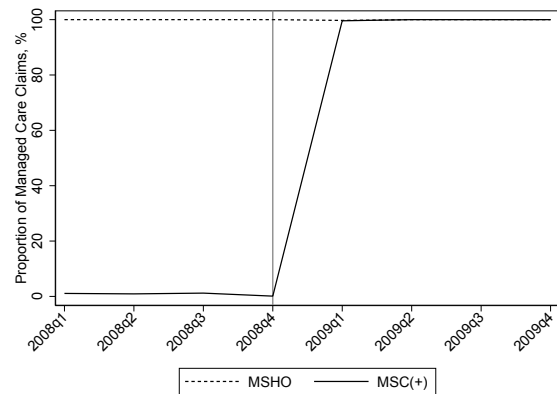
(c) Homemaker Services



(d) Adult Day Care



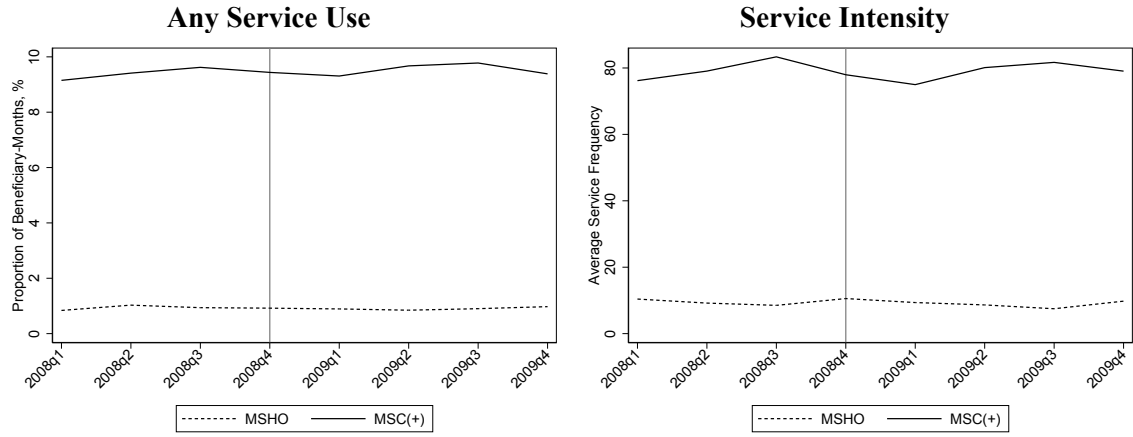
(e) Assisted Living



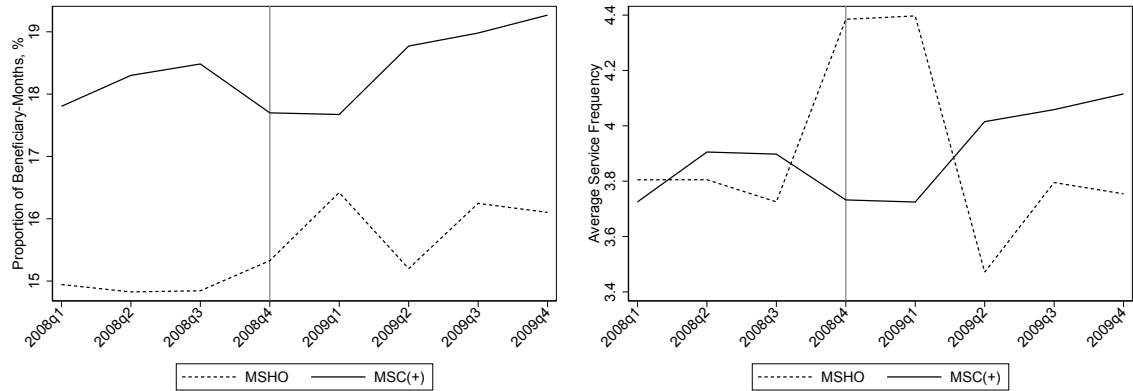
(f) Non-Medical Transportation

Note: Proportion of managed care claims among fee-for-service and managed care claims for a certain service.

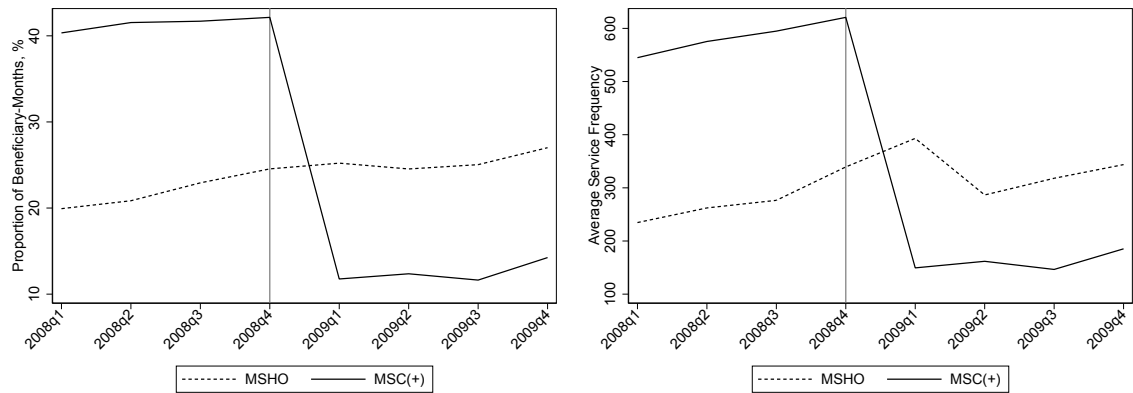
Exhibit 1-6. Trends in Use and Intensity of the Most Common Elderly Waiver HCBS in Treatment (MSC(+)) vs. Comparison (MSHO) Group, 2008–2009



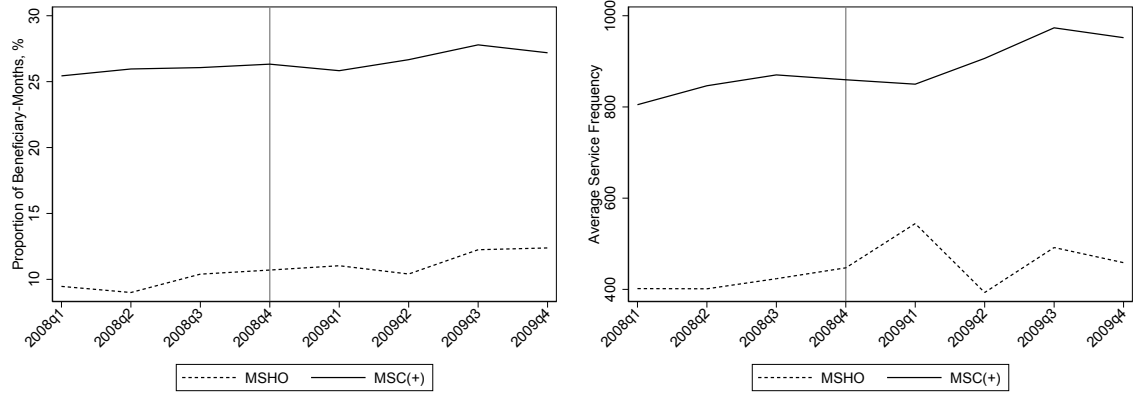
(a) Companion Services (minutes per month)



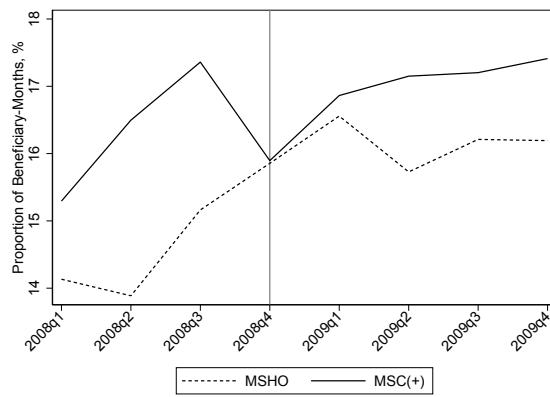
(b) Home-Delivered Meals (times per month)



(c) Homemaker Services (minutes per month)

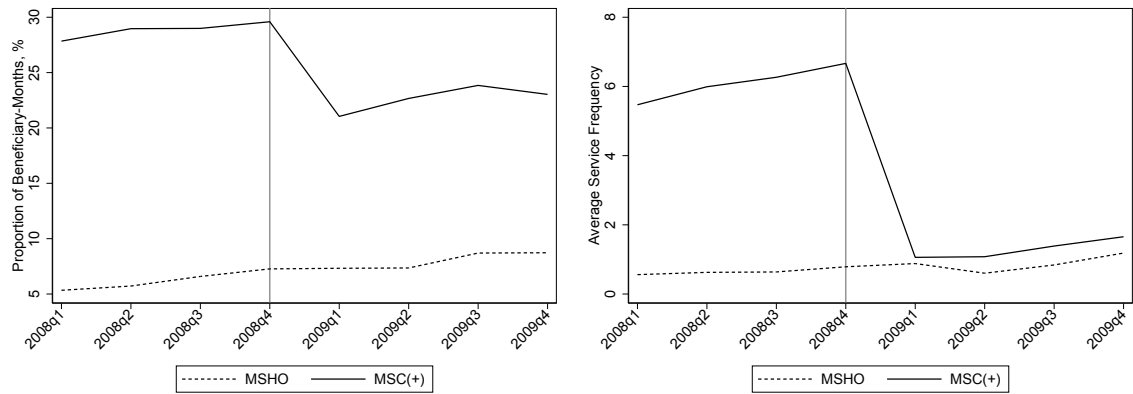


(d) Adult Day Care (minutes per month)



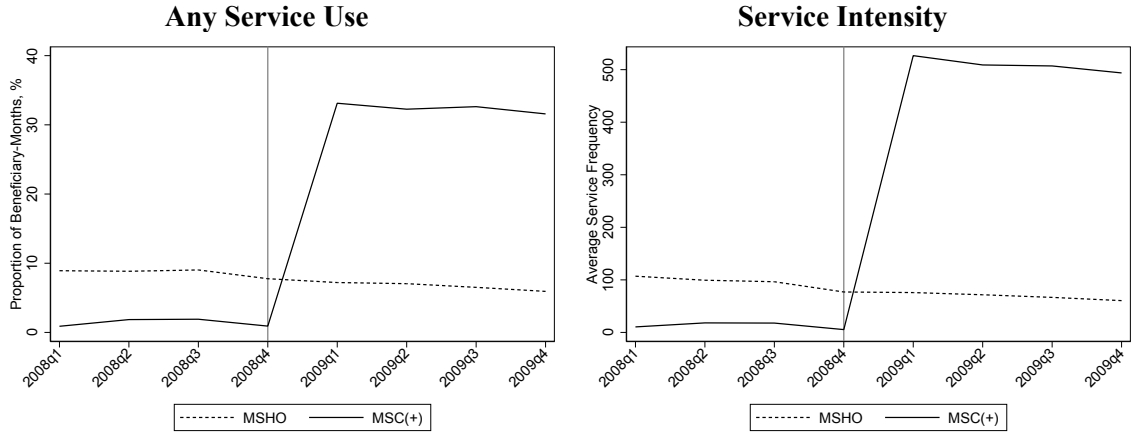
N/A

(e) Assisted Living (monthly claims)

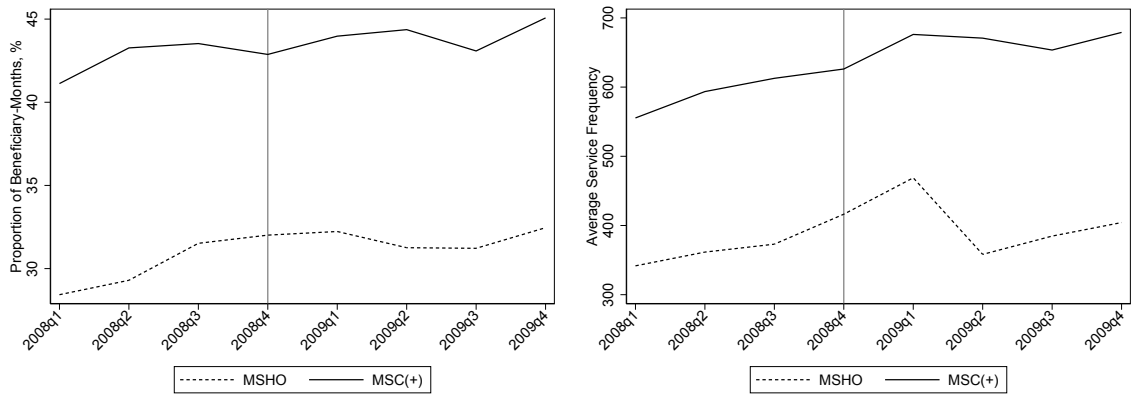


(f) Non-Medical Transportation (times per month)

Exhibit 1-7. Trends in Use and Intensity of Non-Elderly Waiver and Combined Homemaker Services in Treatment (MSC(+)) vs. Comparison (MSHO) Group, 2008–2009

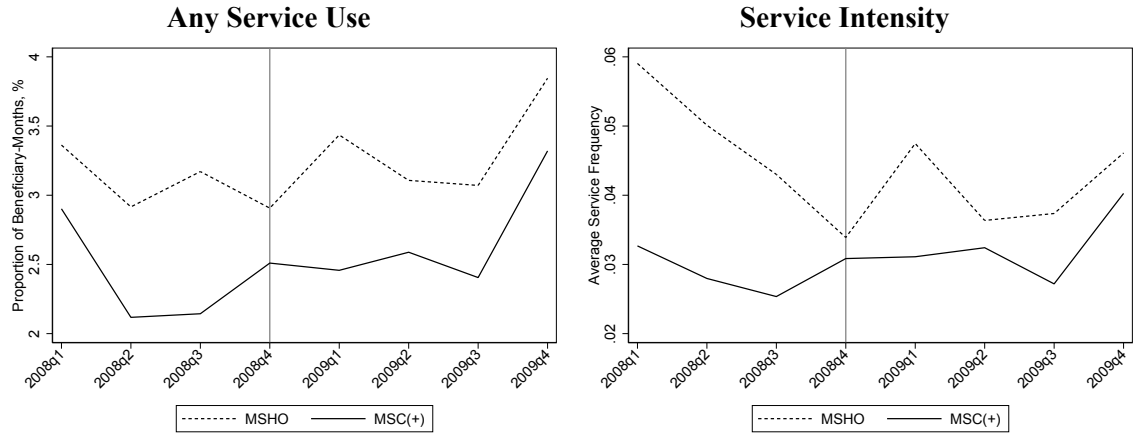


(a) Home Health (Non-Elderly Waiver) Homemaker Services (minutes per month)

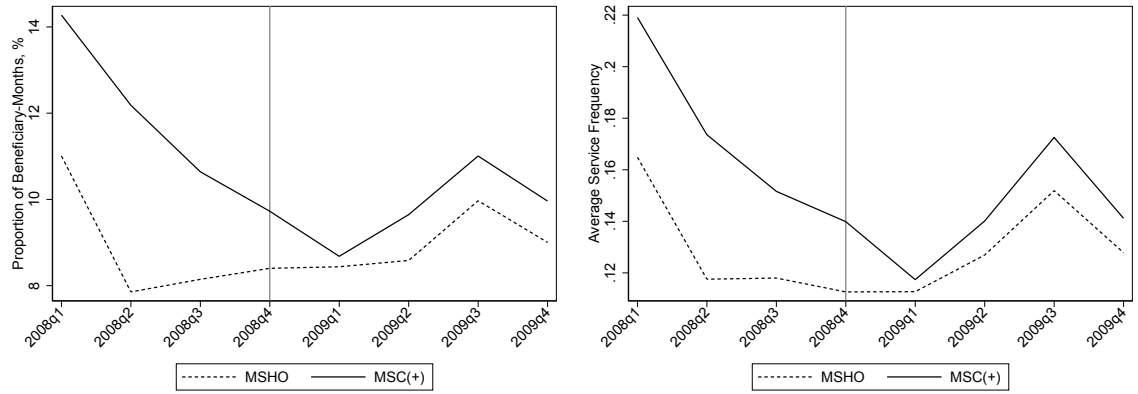


(b) Combined Elderly Waiver and Non-Elderly Waiver Homemaker Services (minutes per month)

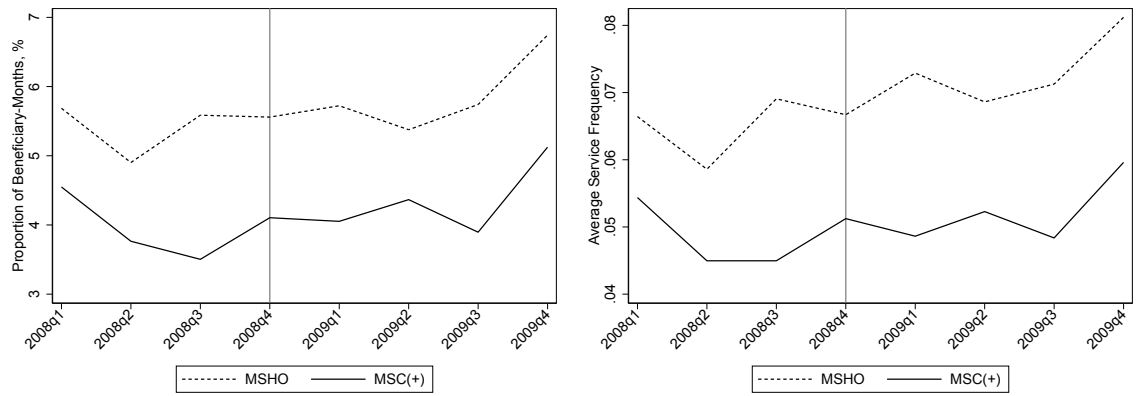
Exhibit 1-8. Trends in Use and Intensity of Hospital and Physician Services in Treatment (MSC(+)) vs. Comparison (MSHO) Group, 2008–2009



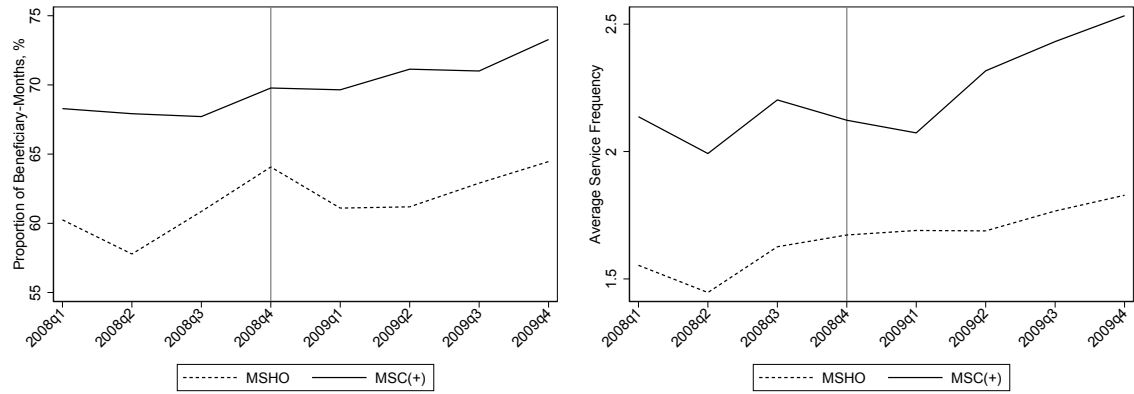
(a) Inpatient Hospitalizations



(b) Outpatient Hospital Visits



(c) ER Visits w/o Hospitalization



(d) Physician Services

Note: Intensity (frequency) limited to the maximum of one event per day for the following outcomes, because multiple events on the same day are not identifiable in the claims data: ER visits without hospitalization; physician services.

Exhibit 1-9. Difference-in-Differences Results Between Treatment (MSC(+)) vs. Comparison (MSHO) Group for LTSS Outcomes, 2008–2009

Outcome	Unadjusted Pre-Period Treatment Group Mean (SD)	DID (95% CI)	P-Value
Any Elderly Waiver HCBS, %	81.69	-0.24 (-1.54 to 1.06)	0.708
Elderly Waiver HCBS (i.e., HCBS shifted to managed care from fee-for-service for the treatment group in the post-period):			
Any companion services, %	9.41	0.18 (-0.32 to 0.69)	0.471
Intensity, minutes per month	79.14 (261.55)	0.97 (-3.20 to 5.14)	0.639
Any home-delivered meals, %	18.07	-0.33 (-2.37 to 1.72)	0.747
Intensity, times per month	3.82 (8.66)	0.25 (-0.33 to 0.84)	0.382
Any homemaker services, %	41.43	-32.26 (-48.04 to -16.48)	<0.001
Intensity, minutes per month	583.97 (1065.88)	-479.92 (-725.16 to -234.69)	<0.001
Any adult day care, %	25.95	-0.71 (-2.89 to 1.48)	0.514
Intensity, minutes per month	845.32 (1646.57)	20.23 (-32.71 to 73.18)	0.442
Any assisted living, %	16.26	-0.50 (-2.66 to 1.66)	0.638
Any non-medical transportation, %	28.85	-8.00 (-12.48 to -3.52)	0.001
Intensity, times per month	6.10 (13.81)	-5.03 (-6.47 to -3.59)	<0.001
Non-Elderly Waiver HCBS (i.e., HCBS already covered in managed care for both groups before the pre-period):			
Any home health, %	34.41	16.79 (7.79 to 25.79)	0.001
Any home health homemaker services, %	1.39	33.04 (16.67 to 49.41)	<0.001
Intensity, minutes per month	12.98 (149.10)	523.42 (261.37 to 785.47)	<0.001
Any non-homemaker home health, %	33.72	0.19 (-1.75 to 2.14)	0.840
Any personal care, %	38.95	0.04 (-1.34 to 1.42)	0.950
Intensity, minutes per month	2354.27 (3957.16)	-4.59 (-485.02 to 475.84)	0.985
Combined Elderly Waiver and non-Elderly Waiver homemaker services:			
Any homemaker services, %	42.70	0.06 (-2.86 to 2.98)	0.966
Intensity, minutes per month	596.95 (1069.59)	43.49 (6.06 to 80.93)	0.024

Notes:

- (1) Frequencies not conditional on service use.
- (2) Controlled for age, gender, race/ethnicity, marital status, Charlson Comorbidity Index, and month, county, and plan fixed effects.
- (3) Standard errors clustered at the county and insurer interaction level (32 clusters).

Exhibit 1-10. Difference-in-Differences Results Between Treatment (MSC(+)) vs. Comparison (MSHO) Group for Hospital and Physician Services Outcomes, 2008–2009

Outcome	Unadjusted Pre-Period Treatment Group Mean (SD)	DID (95% CI)	P-Value
Hospital and physician services:			
Any hospital inpatient stays, %	2.42	0.09 (-0.50 to 0.68)	0.755
Intensity, times per month	0.03 (0.20)	0.01 (0.00 to 0.02)	0.037
Any hospital outpatient visits, %	11.71	-1.86 (-4.17 to 0.44)	0.110
Intensity, times per month	0.17 (0.57)	-0.03 (-0.08 to 0.02)	0.266
Any ER Visits without Hospitalization, %	3.98	0.05 (-0.66 to 0.75)	0.897
Intensity, times per month	0.05 (0.27)	0.00 (-0.01 to 0.01)	0.500
Any physician services, %	68.42	1.57 (-0.51 to 3.66)	0.134
Intensity, times per month	2.11 (2.70)	0.09 (0.01 to 0.17)	0.033

Notes:

- (1) Frequencies not conditional on service use.
- (2) Frequencies limited to the maximum of one event per day for the following outcomes because multiple events on the same day are not identifiable in the claims data: ER visits without hospitalization; physician services.
- (3) Controlled for age, gender, race/ethnicity, marital status, Charlson Comorbidity Index, and month, county, and plan fixed effects.
- (4) Standard errors clustered at the county and insurer interaction level (32 clusters).

Exhibit 2-1. Nursing Facility (NF) Services Coverage in Minnesota’s Medicaid Program for Older Adults (Aged 65 and Older), 2008–2009

Program	2008 (Pre-Period)	2009 (Post-Period)
<p>Minnesota Senior Care (Plus) (MSC(+), the Medicaid-only managed care program; treatment group)</p>	<p>Managed care coverage: - First 90 days for community enrollees</p> <p>Fee-for-service coverage: - After the first 90 days for community enrollees - All services for institutional enrollees</p>	<p>Managed care coverage: - First 180 days for community enrollees</p> <p>Fee-for-service coverage: - After the first 180 days for community enrollees - All services for institutional enrollees</p>
<p>Minnesota Senior Health Options (MSHO, the joint Medicare–Medicaid managed care program; comparison group)</p>	<p>Managed care coverage: - First 180 days for community enrollees</p> <p>Fee-for-service coverage: - After the first 180 days for community enrollees - All services for institutional enrollees</p>	

Exhibit 2-2. Study Population

Population	Number of Medicaid Older Adults (Age≥65) in the Seven-County Minneapolis–St. Paul (MSP) Metro Area			
	2008 (Pre-Period)		2009 (Post-Period)	
	Minnesota Senior Care (MSC) (Treatment Group)	Minnesota Senior Health Options (MSHO) (Comparison Group)	Minnesota Senior Care Plus (MSC+) (Treatment Group)	MSHO (Comparison Group)
[1] Beneficiaries enrolled in managed care for all 12 months in the year	16,600		18,118	
[2] Among [1], beneficiaries enrolled in managed care and served by the same insurer for all 12 months in the year	16,187		17,673	
[3] Among [2], beneficiaries enrolled in the same managed care program (either MSC(+) or MSHO) and served by the same insurer for all 12 months in the year ([3]=[7]+[8])	3,699	11,657	4,133	12,623
[4] Among [3], beneficiaries who had any nursing facility (NF) claims in the year ([4]=[5]+[7])	736	3,679	867	3,683
[5] Among [4], beneficiaries who had any managed care NF claims in the year	277	1,406	306	1,463
[6] Among [5], beneficiaries who had any managed care NF claims early in the year so that fee-for-service may take over NF services later	209	841	153	837
[7] Among [4], beneficiaries who only had fee-for-service NF claims in the year (institutional enrollees)	459	2,273	561	2,220
[8] Among [3], beneficiaries who were not institutional enrollees	3,240	9,384	3,572	10,403

Notes:

(1) NF services included both short-term (post-acute) and long-term care, which could not be differentiated in the data. However, the Medicaid managed care NF day cap applied to both post-acute and long-term care.

(2) In both years, there were five managed care plans (insurers) operating in the MSP metro area, and they all participated in both MSC(+) and MSHO programs.

(3) In Line [6], the NF claims identified as early in the year were those in which a beneficiary was admitted into an NF before October 1 for MSC (2008) and July 1 for MSC+ (2009) and MSHO (2008 and 2009). If a beneficiary was admitted into an NF before the corresponding cut-off date, then the insurer could accumulate enough NF days to later transfer NF services to the fee-for-service program (90 managed care NF days for MSC (2008); 180 for MSC+ (2009) and MSHO (2008 and 2009)).

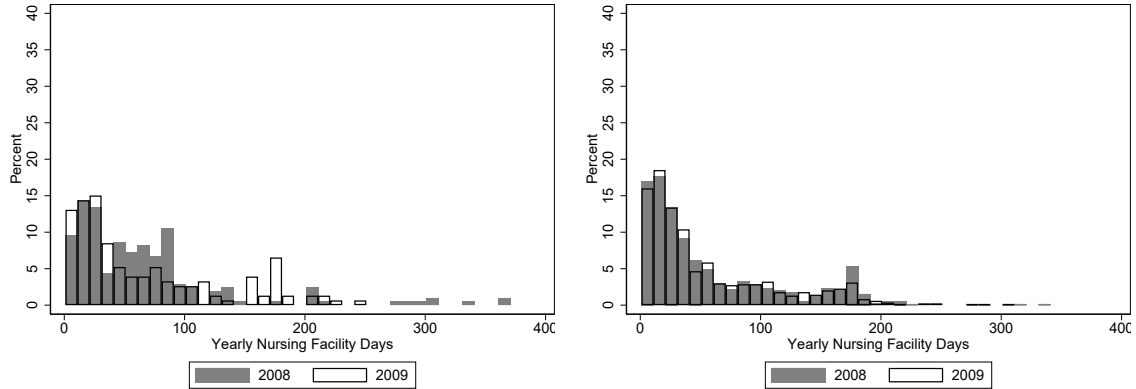
(4) In Line [7], beneficiaries with only fee-for-service NF claims during the year were considered as institutional enrollees, because neither MSC(+) nor MSHO had the responsibility to pay for NF services for institutional enrollees.

Exhibit 2-3. Beneficiary Characteristics in Treatment vs. Comparison Group, January 2008 and 2009

Beneficiary Characteristic	Jan. 2008 (First Month in the Pre-Period)			Jan. 2009 (First Month in the Post-Period)		
	MSC Beneficiaries (Treatment Group) [N=3,240]	MSHO Beneficiaries (Comparison Group) [N=9,384]	P-Value for Difference	MSC+ Beneficiaries (Treatment Group) [N=3,572]	MSHO Beneficiaries (Comparison Group) [N=10,403]	P-Value for Difference
Age, mean (SD), years	75.33 (7.99)	76.41 (7.70)	0.026	75.22 (7.96)	76.26 (7.78)	0.099
Female, %	67.28	70.43	0.001	66.27	69.36	0.005
Race/ethnicity:						
Asian, %	12.53	27.37	<0.001	13.02	27.77	0.001
Black, %	12.62	15.10	0.540	14.73	16.37	0.714
Hispanic, %	1.70	2.63	0.078	2.02	2.63	0.267
Multiple, %	0.03	0.12	0.040	0.06	0.14	0.085
Native, %	1.05	1.19	0.774	1.29	1.10	0.734
Pacific, %	0.12	0.06	0.473	0.20	0.08	0.249
Unknown, %	1.48	1.51	0.935	1.32	1.61	0.397
White, %	70.46	52.01	0.009	67.39	50.29	0.028
Marital status:						
Divorced, %	16.11	20.94	0.008	17.05	21.31	0.037
Legally separated, %	0.37	0.36	0.943	0.48	0.38	0.558
Married, living with spouse, %	18.21	9.73	0.065	17.39	10.44	0.125
Never Married, %	13.02	13.92	0.689	14.84	14.05	0.727
Married, living separately from spouse, %	14.48	16.79	0.196	13.75	17.06	0.069
Unknown, %	0.06	0.04	0.714	0.08	0.04	0.508
Widowed, %	37.75	38.21	0.741	36.42	36.71	0.820
Charlson Comorbidity Index, mean (SD)	1.14 (1.65)	1.19 (1.61)	0.262	1.16 (1.61)	1.26 (1.69)	0.178

Note: Standard errors clustered at the county and insurer interaction level (34 clusters).

Exhibit 2-4. Distributions of Managed Care NF Days in a Year, 2008 (Pre-Period) and 2009 (Post-Period)



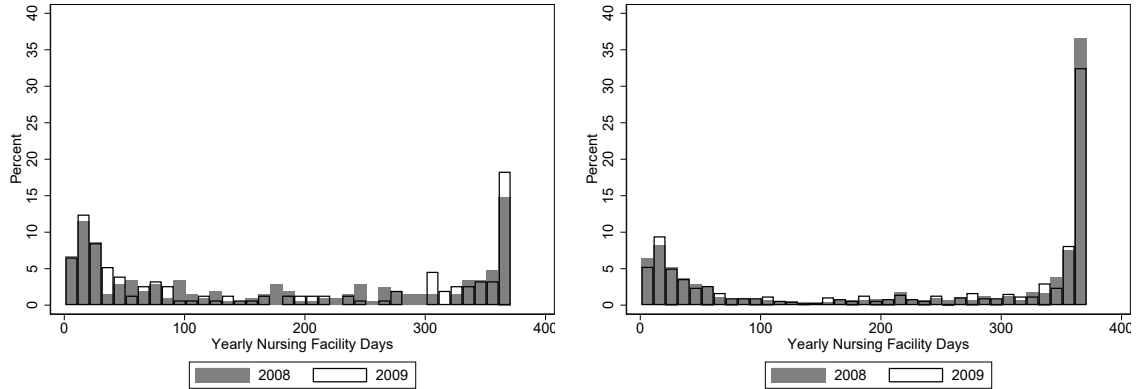
(a) Minnesota Senior Care (Plus) (MSC(+))

(b) Minnesota Senior Care Options (MSHO)

Notes:

- (1) NF services included both short-term (post-acute) and long-term care, which could not be differentiated in the data. However, the Medicaid managed care NF day cap applied to both post-acute and long-term care.
- (2) For beneficiaries with any managed care NF claims early in the year (so that the managed care plan could accumulate enough NF days to later transfer NF services to the fee-for-service program). The NF claims identified as early in the year were those in which a beneficiary was admitted into an NF before October 1 for MSC (2008) and July 1 for MSC+ (2009) and MSHO (2008 and 2009).

Exhibit 2-5. Distributions of All (Managed Care and Fee-for-Service) NF Days in a Year, 2008 (Pre-Period) and 2009 (Post-Period)



(a) Minnesota Senior Care (Plus) (MSC(+)) (b) Minnesota Senior Care Options (MSHO)

Notes:

- (1) NF services included both short-term (post-acute) and long-term care, which could not be differentiated in the data. However, the Medicaid managed care NF day cap applied to both post-acute and long-term care.
- (2) For beneficiaries with any managed care NF claims early in the year (so that the managed care plan could accumulate enough NF days to later transfer NF services to the fee-for-service program). The NF claims identified as early in the year were those in which a beneficiary was admitted into an NF before October 1 for MSC (2008) and July 1 for MSC+ (2009) and MSHO (2008 and 2009).

Exhibit 2-6. Difference-in-Differences Results for NF Services Outcomes (Part 1), Between Treatment (MSC(+)) and Comparison (MSHO) Groups, 2008–2009

Outcome	Change in Treatment Group (95% CI), P-Value	Change in Comparison Group (95% CI), P-Value	Difference in Changes (95% CI), P-Value
Managed Care Nursing Facility (NF) Services:			
Any services after the first 90 days, for beneficiaries having managed care NF claims early in the year and having more than 90 NF days, %	19.79 (-0.33 to 39.91), P=0.054	0.51 (-6.60 to 7.61), P=0.885	19.29 (0.59 to 37.98), P=0.044
Days of services after the first 90 days in a year, for beneficiaries having managed care NF claims early in the year and having more than 90 NF days	6.46 (-14.55 to 27.47), P=0.534	-1.06 (-6.41 to 4.29), P=0.688	7.52 (-13.02 to 28.07), P=0.459

Notes:

- (1) NF services included both short-term (post-acute) and long-term care, which could not be differentiated in the data. However, the Medicaid managed care NF day cap applied to both post-acute and long-term care.
- (2) Controlled for age, gender, race/ethnicity, marital status, Charlson Comorbidity Index, and month, county, and plan fixed effects.
- (3) Standard errors clustered at the county and insurer interaction level (29 clusters).

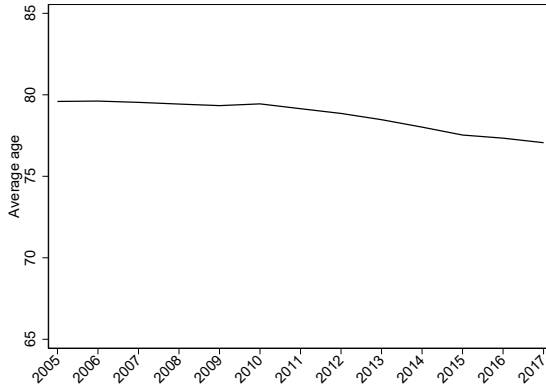
Exhibit 2-7. Difference-in-Differences Results for NF Services Outcomes (Part 2), Between Treatment (MSC(+)) and Comparison (MSHO) Groups, 2008–2009

Outcome	Change in Treatment Group (95% CI), P-Value	Change in Comparison Group (95% CI), P-Value	Difference in Changes (95% CI), P-Value
Managed Care Nursing Facility (NF) Services:			
Any services during the year, %	-0.11 (-1.18 to 0.96), P=0.837	-0.98 (-1.76 to -0.19), P=0.017	0.87 (-0.47 to 2.21), P=0.197
Days of services in a year	0.22 (-1.22 to 1.65), P=0.761	-0.43 (-1.21 to 0.36), P=0.274	0.65 (-0.94 to 2.23), P=0.413
Days of services in a year, conditional on any services	3.29 (-8.85 to 15.44), P=0.584	-0.03 (-4.64 to 4.58), P=0.989	3.33 (-10.01 to 16.66), P=0.614
Days of services in a year, for beneficiaries having managed care NF claims early in the year	3.65 (-17.38 to 24.68), P=0.726	-0.49 (-7.54 to 6.55), P=0.887	4.14 (-16.89 to 25.17), P=0.690
All (Managed Care and Fee-for-Service) NF Services:			
Days of services in a year	-0.34 (-3.23 to 2.55), P=0.813	-4.10 (-6.02 to -2.18), P<0.001	3.76 (0.09 to 7.43), P=0.045
Days of services in a year, conditional on any services	0.85 (-25.91 to 27.62), P=0.949	-15.66 (-22.51 to -8.81), P<0.001	16.51 (-11.70 to 44.73), P=0.242
Days of services in a year, for beneficiaries having managed care NF claims early in the year	8.36 (-24.44 to 41.16), P=0.606	-6.48 (-14.98 to 2.03), P=0.130	14.84 (-19.14 to 48.82), P=0.380

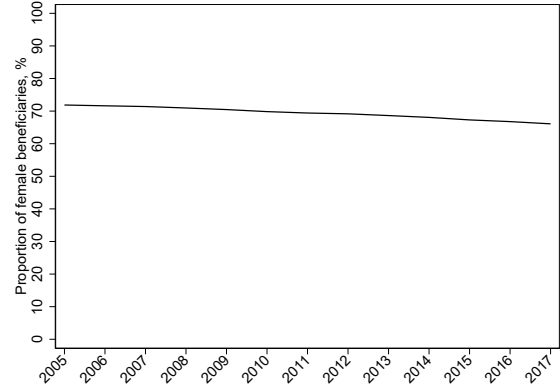
Notes:

- (1) NF services included both short-term (post-acute) and long-term care, which could not be differentiated in the data. However, the Medicaid managed care NF day cap applied to both post-acute and long-term care.
- (2) Controlled for age, gender, race/ethnicity, marital status, Charlson Comorbidity Index, and month, county, and plan fixed effects.
- (3) Standard errors clustered at the county and insurer interaction level (31-34 clusters).

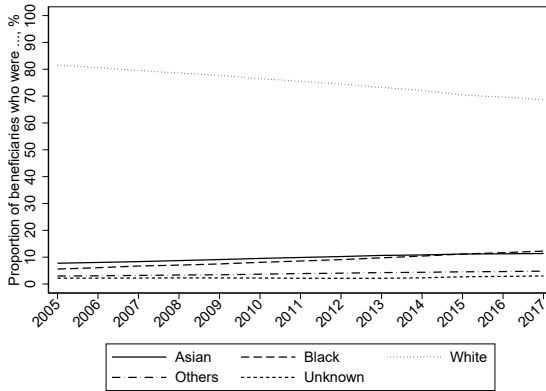
Exhibit 3-1. Trends in Demographics of Medicaid Older Adults (Age \geq 65) in Minnesota, 2005–2017



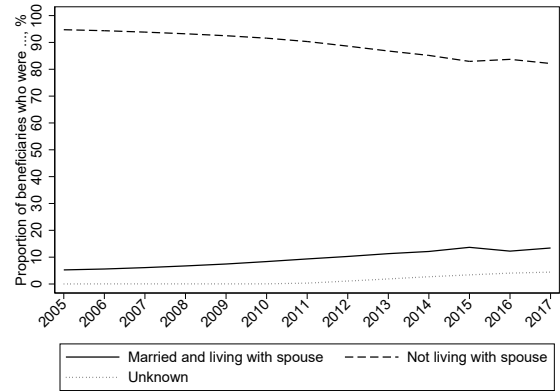
(a) Age



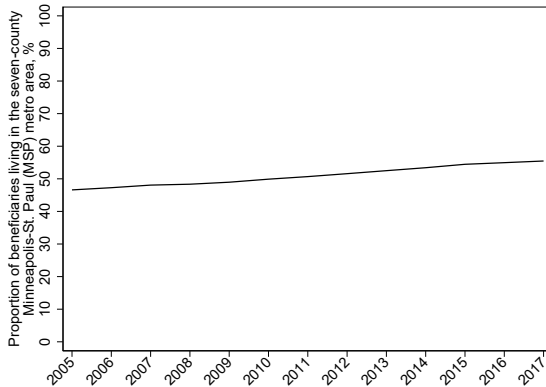
(b) Gender



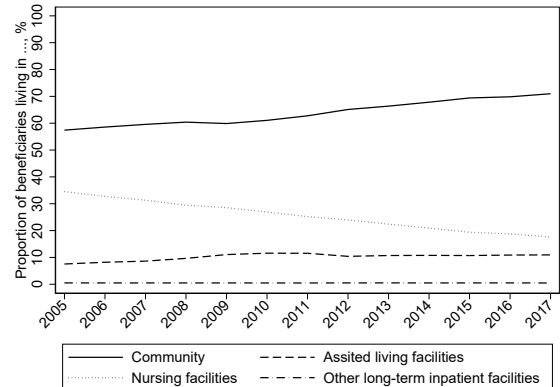
(c) Race



(d) Marital Status



(e) Living in the Minneapolis-St. Paul (MSP) Metro Area or Not

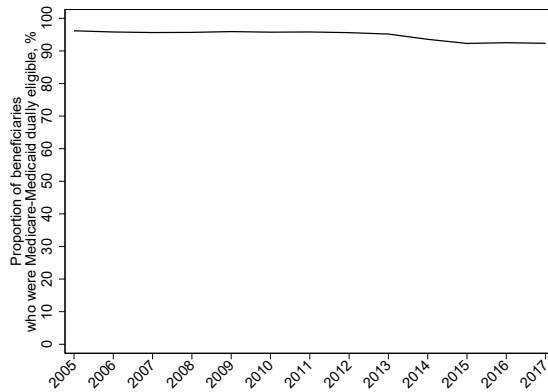


(f) Community or Institutional Living Arrangement

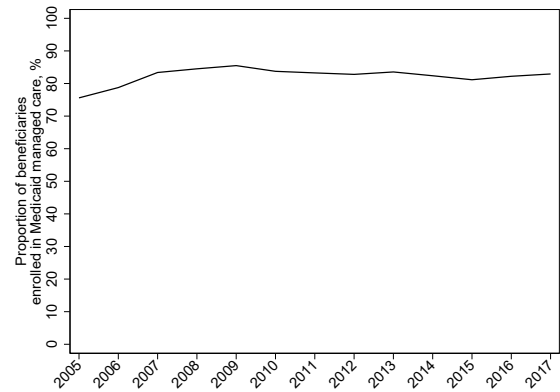
Notes:

- (1) Weighted by enrollment months during the year of individual beneficiaries.
- (2) The following months were excluded due to abruptly and temporarily high proportions of fee-for-service Medicaid beneficiaries among the study population in the data: April 2013 and January 2015, 2016, and 2017.

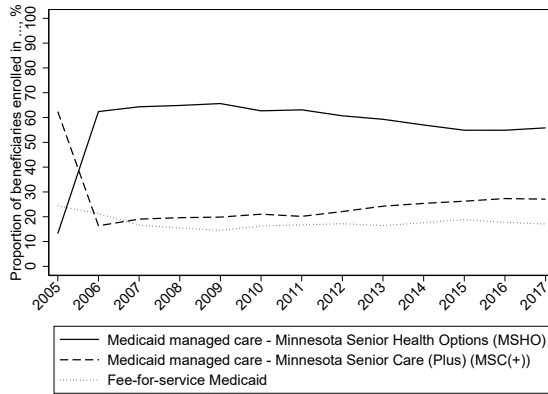
Exhibit 3-2. Trends in Enrollment of Medicare and Medicaid Programs of Medicaid Older Adults (Age \geq 65) in Minnesota, 2005–2017



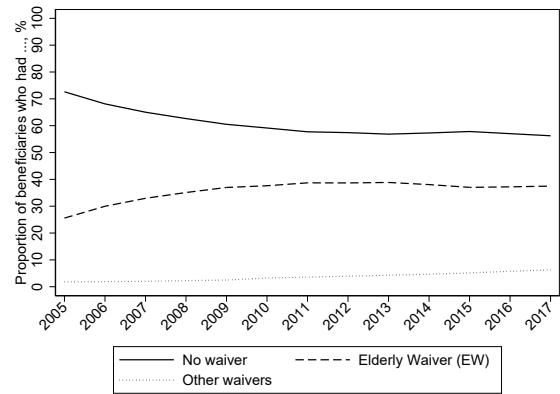
(a) Medicare-Medicaid Dual Eligibility



(b) Medicaid Managed Care Enrollment (General)



(c) Medicaid Managed Care Enrollment (Program Specific)

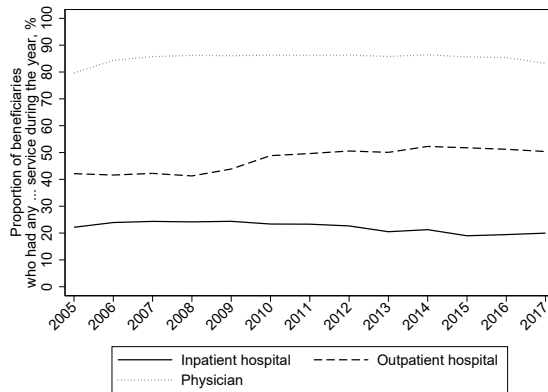


(d) Medicaid Waiver Status

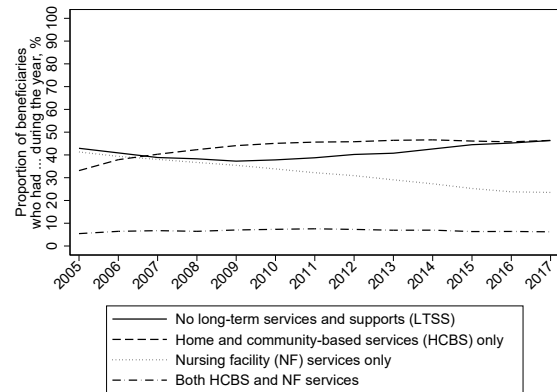
Notes:

- (1) Weighted by enrollment months during the year of individual beneficiaries.
- (2) The following months were excluded due to abruptly and temporarily high proportions of fee-for-service Medicaid beneficiaries among the study population in the data: April 2013 and January 2015, 2016, and 2017.

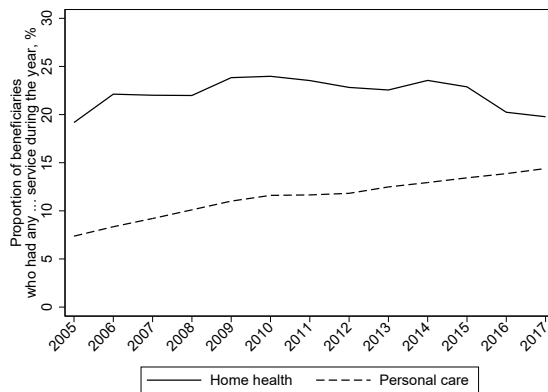
Exhibit 3-3. Trends in Use of Hospital and Physician Services and Long-Term Services and Supports (LTSS) of Medicaid Older Adults (Age \geq 65) in Minnesota, 2005–2017



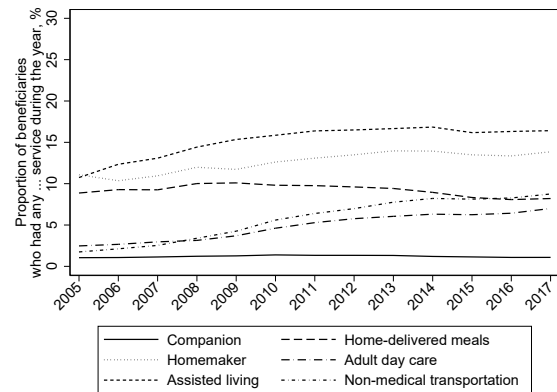
(a) Hospital and Physician Services



(b) Long-Term Services and Supports (LTSS) (General)



(c) LTSS - Home and Community-Based Services (Home Health and Personal Care)

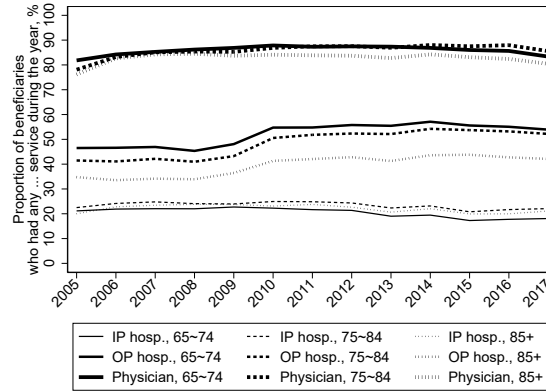


(d) LTSS - Home and Community-Based Services (Others)

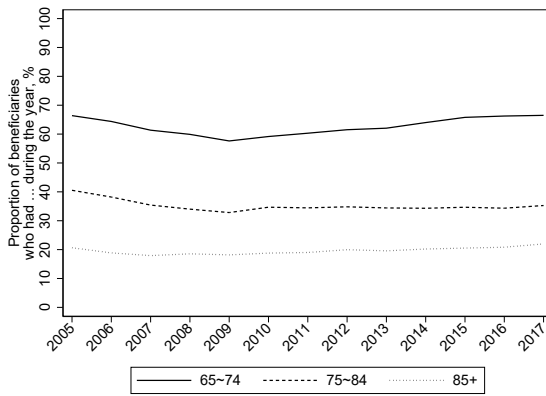
Notes:

- (1) NF services may include short-term post-acute care, which could not be differentiated from NF long-term care in the data.
- (2) Home health may include homemaker services in some occasions.
- (3) The following months were excluded due to abruptly and temporarily high proportions of fee-for-service Medicaid beneficiaries among the study population in the data: April 2013 and January 2015, 2016, and 2017.

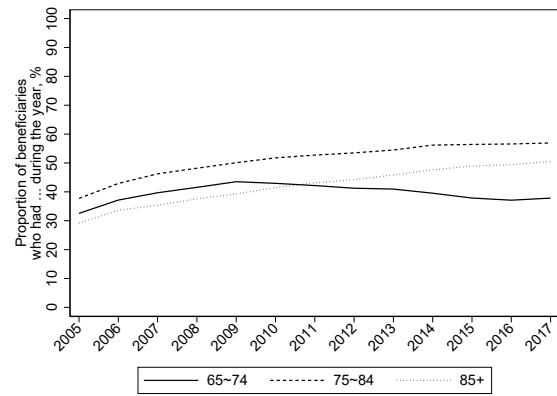
Exhibit 3-4. Trends in Hospital and Physician Services and LTSS Use of Medicaid Older Adults in Minnesota, 2005–2017, Stratified by Age Group



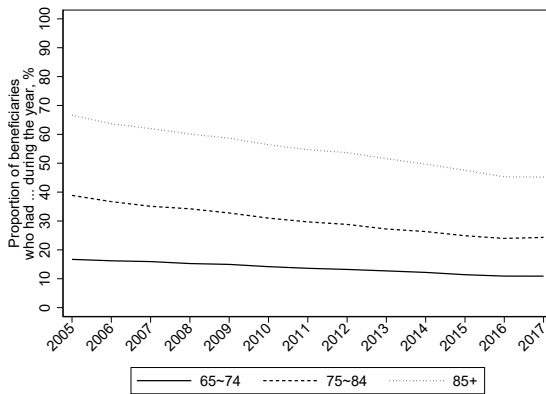
(a) Hospital and Physician Services



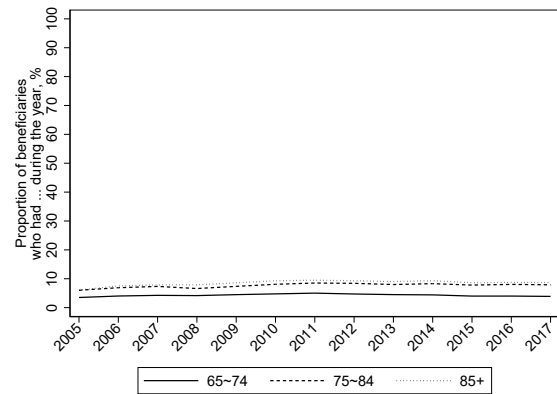
(b) No LTSS



(c) LTSS - HCBS Only



(d) LTSS - NF Services Only

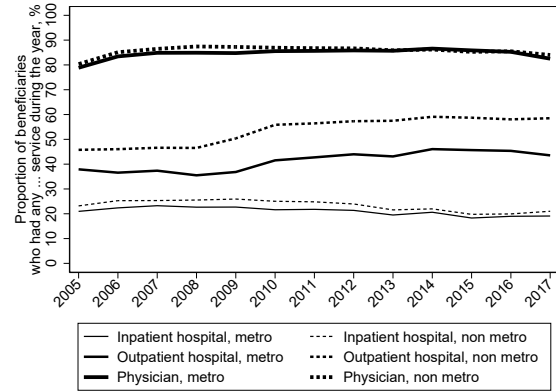


(e) LTSS - Both HCBS and NF Services

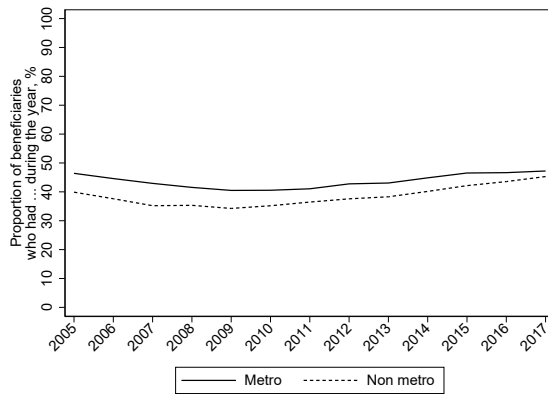
Notes:

- (1) NF services may include short-term post-acute care, which could not be differentiated from NF long-term care in the data.
- (2) The following months were excluded due to abruptly and temporarily high proportions of fee-for-service Medicaid beneficiaries among the study population in the data: April 2013 and January 2015, 2016, and 2017.

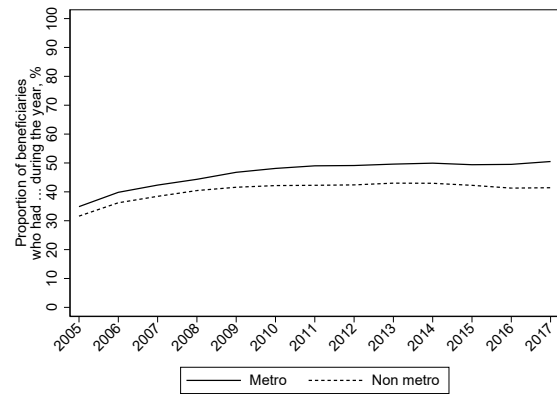
Exhibit 3-5. Trends in Hospital and Physician Services and LTSS Use of Medicaid Older Adults in Minnesota, 2005–2017, Stratified by Living in the MSP Metro Area or Not



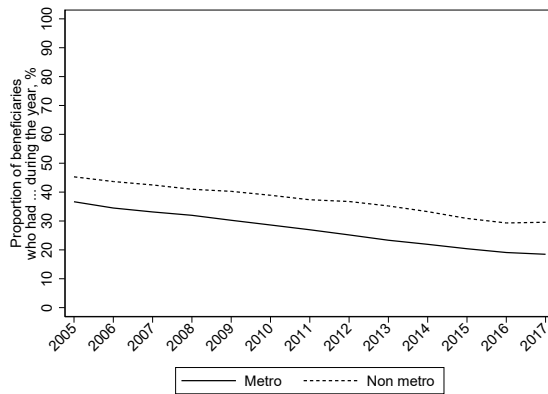
(a) Hospital and Physician Services



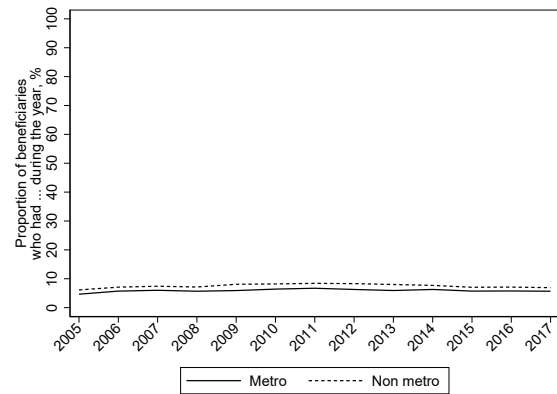
(b) No LTSS



(c) LTSS - HCBS Only



(d) LTSS - NF Services Only

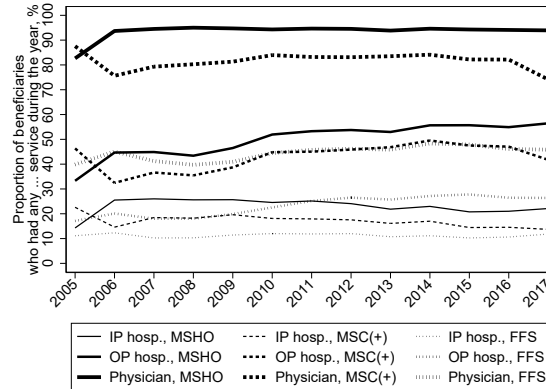


(e) LTSS - Both HCBS and NF Services

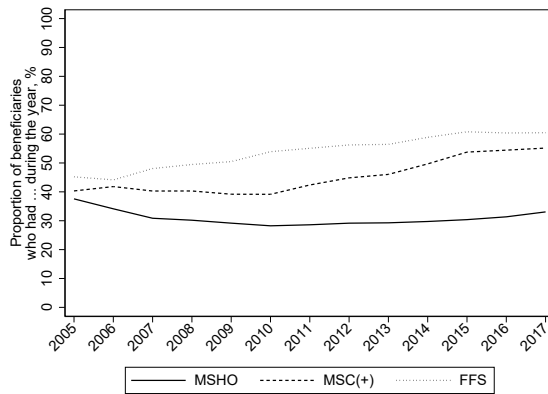
Notes:

- (1) NF services may include short-term post-acute care, which could not be differentiated from NF long-term care in the data.
- (2) The following months were excluded due to abruptly and temporarily high proportions of fee-for-service Medicaid beneficiaries among the study population in the data: April 2013 and January 2015, 2016, and 2017.

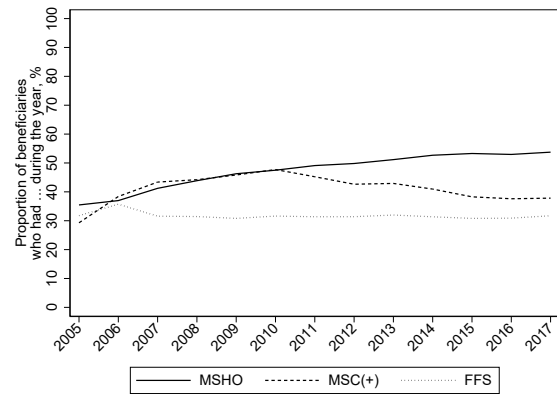
Exhibit 3-6. Trends in Hospital and Physician Services and LTSS Use of Medicaid Older Adults in Minnesota, 2005–2017, Stratified by Medicaid Managed Care Enrollment



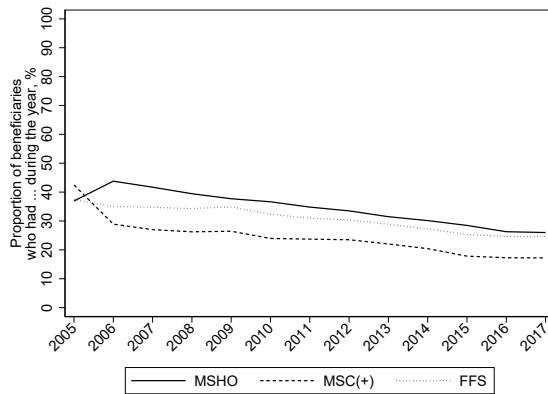
(a) Hospital and Physician Services



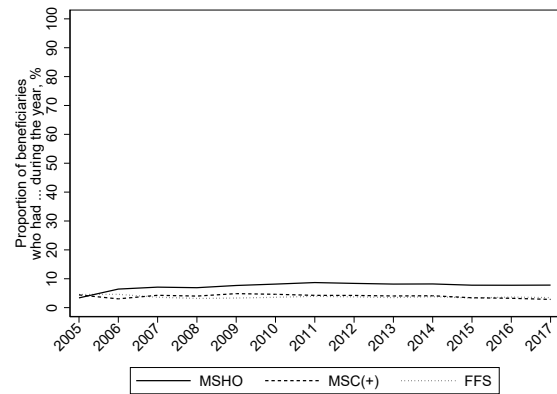
(b) No LTSS



(c) LTSS - HCBS Only



(d) LTSS - NF Services Only

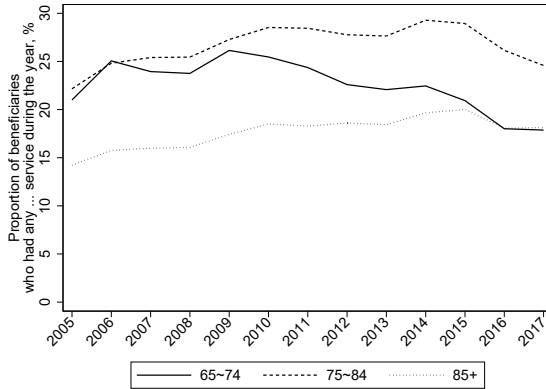


(e) LTSS - Both HCBS and NF Services

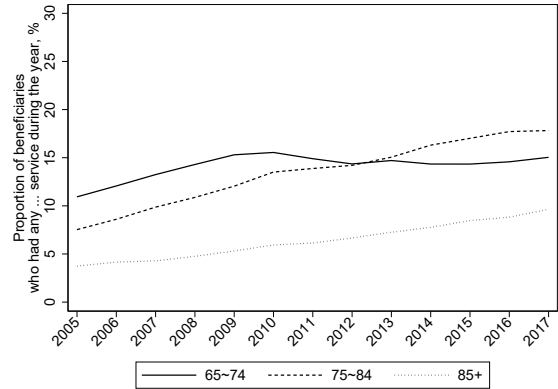
Notes:

- (1) NF services may include short-term post-acute care, which could not be differentiated from NF long-term care in the data.
- (2) The following months were excluded due to abruptly and temporarily high proportions of fee-for-service Medicaid beneficiaries among the study population in the data: April 2013 and January 2015, 2016, and 2017.

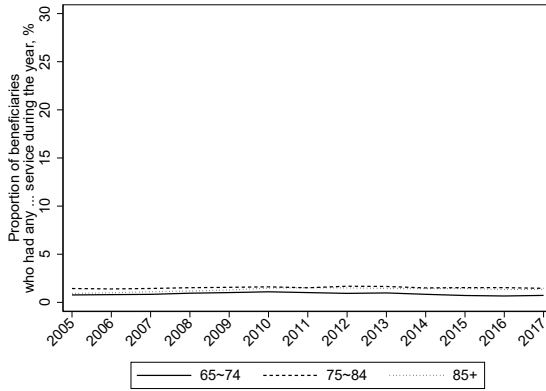
Exhibit 3-7. Trends in HCBS Use of Medicaid Older Adults in Minnesota, 2005–2017, Stratified by Age Group



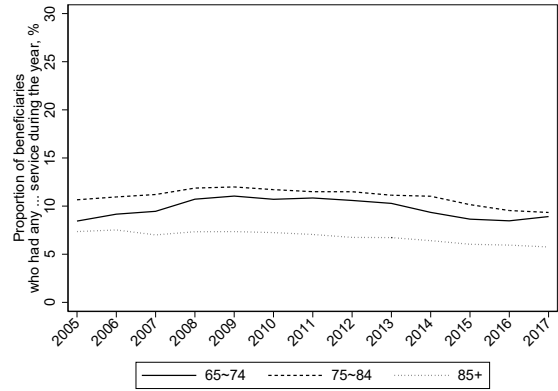
(a) Home Health



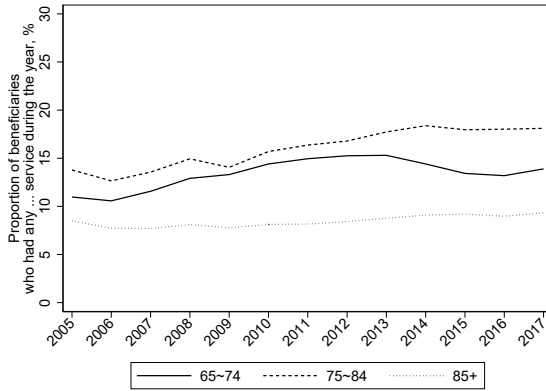
(b) Personal Care



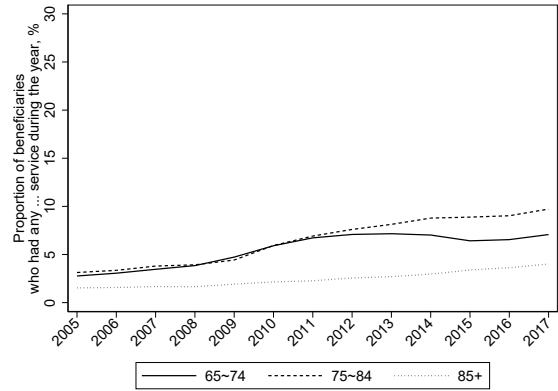
(c) Companion



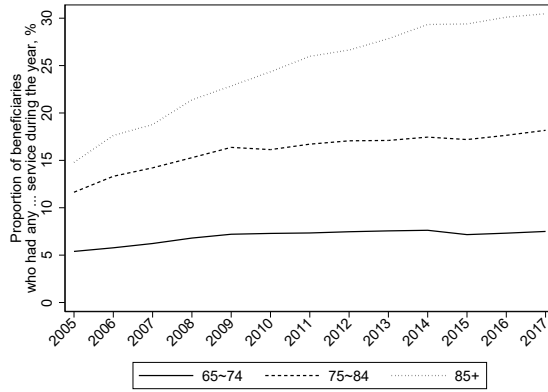
(d) Home-Delivered Meals



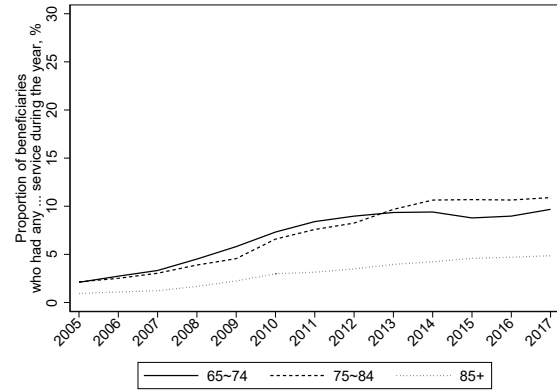
(e) Homemaker



(f) Adult Day Care



(g) Assisted Living

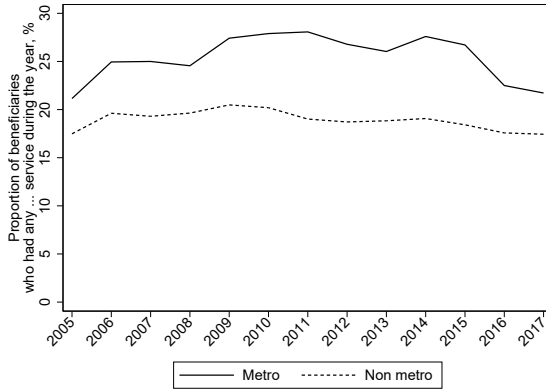


(h) Non-Medical Transportation

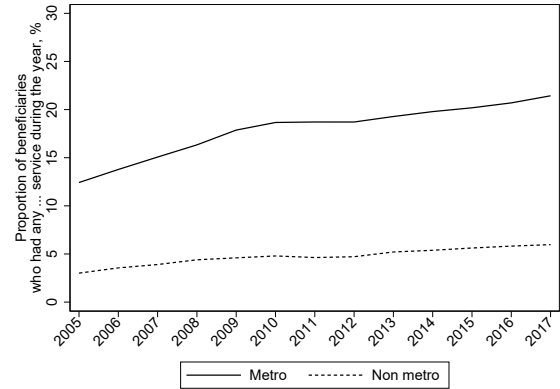
Notes:

- (1) Home health may include homemaker services in some occasions.
- (2) The following months were excluded due to abruptly and temporarily high proportions of fee-for-service Medicaid beneficiaries among the study population in the data: April 2013 and January 2015, 2016, and 2017.

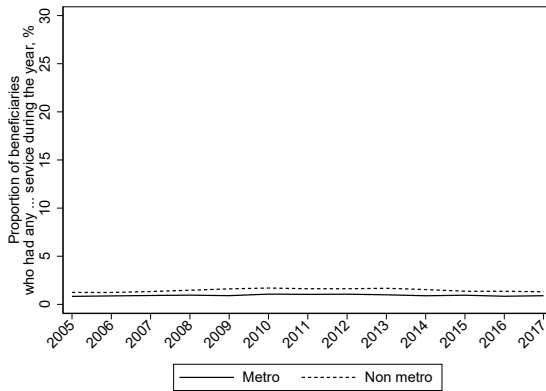
Exhibit 3-8. Trends in HCBS Use of Medicaid Older Adults in Minnesota, 2005–2017, Stratified by Living in the MSP Metro Area or Not



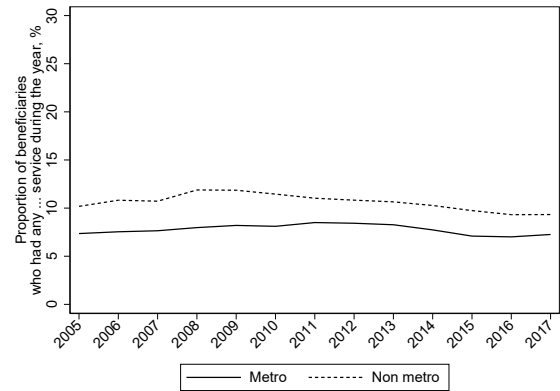
(a) Home Health



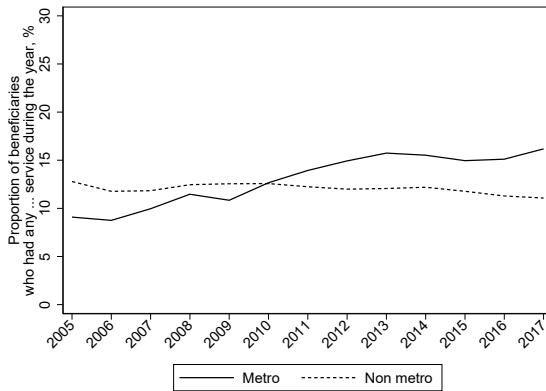
(b) Personal Care



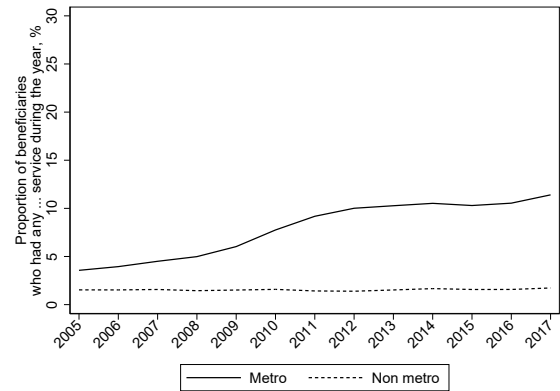
(c) Companion



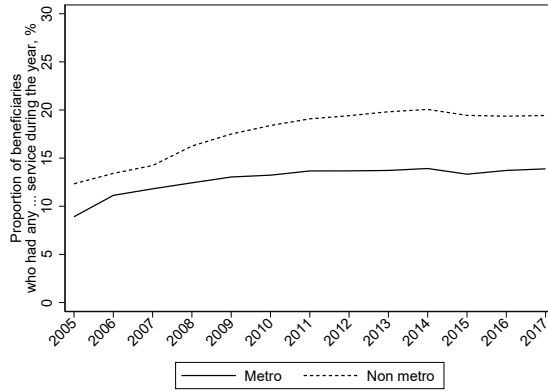
(d) Home-Delivered Meals



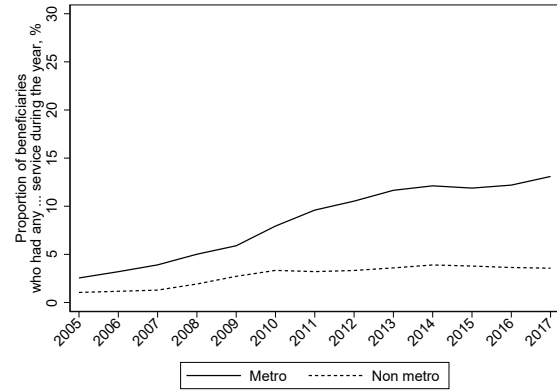
(e) Homemaker



(f) Adult Day Care



(g) Assisted Living

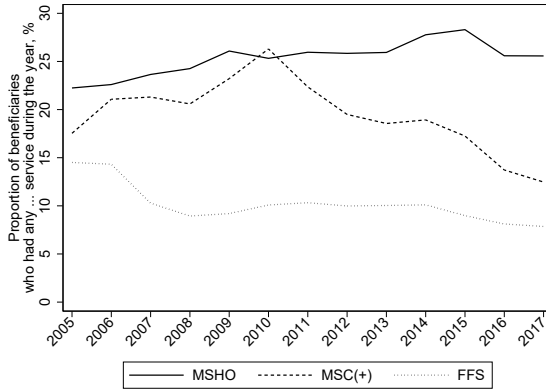


(h) Non-Medical Transportation

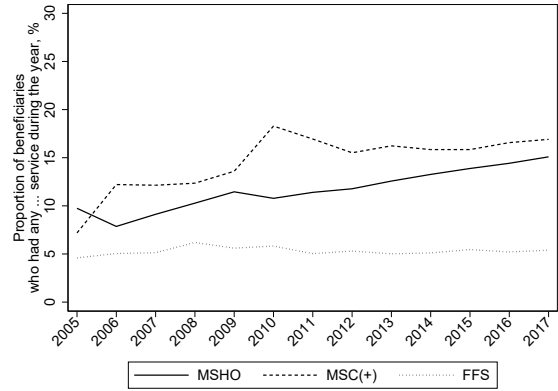
Notes:

- (1) Home health may include homemaker services in some occasions.
- (2) The following months were excluded due to abruptly and temporarily high proportions of fee-for-service Medicaid beneficiaries among the study population in the data: April 2013 and January 2015, 2016, and 2017.

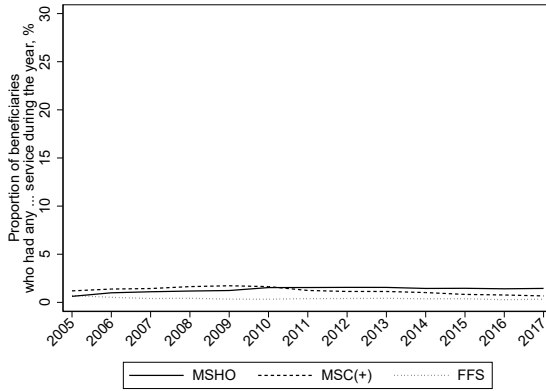
Exhibit 3-9. Trends in HCBS Use of Medicaid Older Adults in Minnesota, 2005–2017, Stratified by Medicaid Managed Care Enrollment



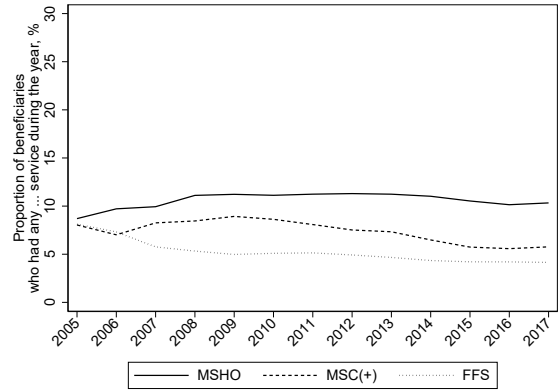
(a) Home Health



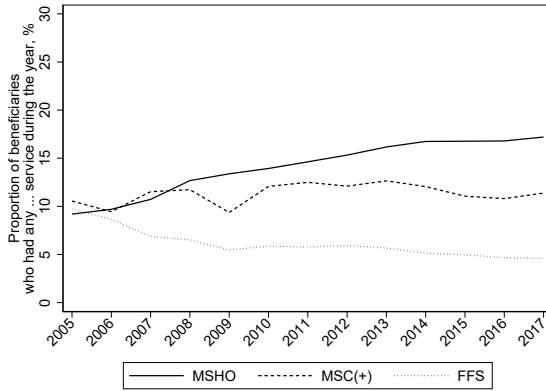
(b) Personal Care



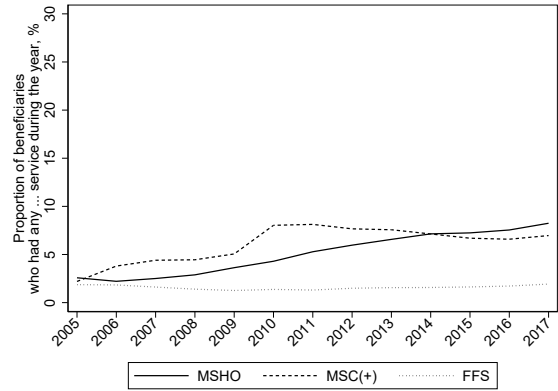
(c) Companion



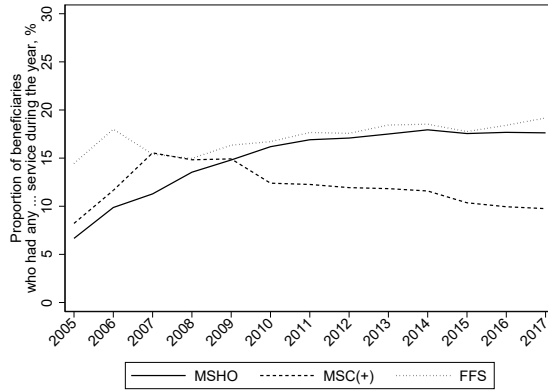
(d) Home-Delivered Meals



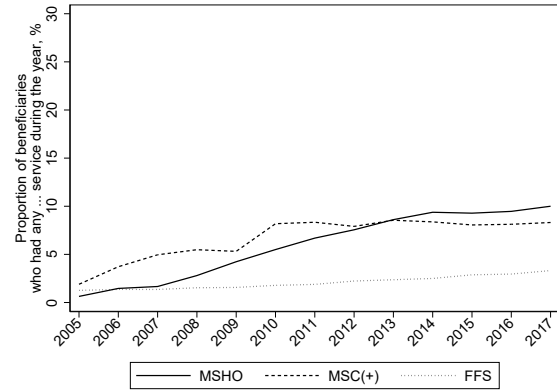
(e) Homemaker



(f) Adult Day Care



(g) Assisted Living



(h) Non-Medical Transportation

Notes:

- (1) Home health may include homemaker services in some occasions.
- (2) The following months were excluded due to abruptly and temporarily high proportions of fee-for-service Medicaid beneficiaries among the study population in the data: April 2013 and January 2015, 2016, and 2017.

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Appendix Exhibits

Appendix Exhibit 1-1. Unadjusted Means of Outcomes in Treatment (MSC(+)) vs. Comparison (MSHO) Group, 2008–2009

Outcome	Treatment Group Mean (SD)		Comparison Group Mean (SD)	
	Pre-Period (2008)	Post-Period (2009)	Pre-Period (2008)	Post-Period (2009)
Any Elderly Waiver HCBS, %	81.69	83.94	86.04	88.69
Elderly Waiver HCBS (i.e., HCBS added in managed care for the treatment group in the post-period):				
Any companion services, %	9.41	9.54	0.93	0.90
Intensity, minutes per month	79.14 (261.55)	78.96 (258.86)	9.67 (168.74)	8.82 (137.22)
Any home-delivered meals, %	18.07	18.67	14.99	15.99
Intensity, times per month	3.82 (8.66)	3.98 (9.00)	3.93 (11.15)	3.85 (10.04)
Any homemaker services, %	41.43	12.50	22.06	25.45
Intensity, minutes per month	583.97 (1065.88)	160.75 (651.15)	278.20 (841.08)	335.36 (862.23)
Any adult day care, %	25.95	26.87	9.89	11.52
Intensity, minutes per month	845.32 (1646.57)	920.44 (1760.24)	418.45 (1595.49)	471.96 (1641.29)
Any assisted living, %	16.26	17.16	14.76	16.17
Any non-medical transportation, %	28.85	22.65	6.23	8.03
Intensity, times per month	6.10 (13.81)	1.30 (5.93)	0.65 (4.25)	0.88 (5.88)
Non-Elderly Waiver HCBS (i.e., HCBS already covered in managed care for both groups before the pre-period):				
Any home health, %	34.41	50.88	34.99	35.01
Any home health homemaker services, %	1.39	32.40	8.64	6.67
Intensity, minutes per month	12.98 (149.10)	509.11 (1199.22)	94.94 (562.20)	68.67 (382.50)
Any non-homemaker home health, %	33.72	34.89	31.16	32.48
Any personal care, %	38.95	40.79	40.84	42.64
Intensity, minutes per month	2354.27 (3957.16)	2889.33 (4419.15)	3038.89 (6035.87)	3588.78 (5861.90)
Combined Elderly Waiver and non-Elderly Waiver homemaker services:				
Any homemaker services, %	42.70	44.12	30.31	31.79
Intensity, minutes per month	596.95 (1069.59)	669.87 (1315.29)	373.15 (992.59)	404.04 (926.86)
Hospital and physician services:				

Any hospital inpatient stays, %	2.42	2.69	3.09	3.36
Intensity, times per month	0.03 (0.20)	0.03 (0.23)	0.05 (0.30)	0.04 (0.25)
Any hospital outpatient visits, %	11.71	9.82	8.85	9.00
Intensity, times per month	0.17 (0.57)	0.14 (0.57)	0.13 (0.53)	0.13 (0.52)
Any ER Visits without Hospitalization, %	3.98	4.36	5.43	5.90
Intensity, times per month	0.05 (0.27)	0.05 (0.27)	0.07 (0.30)	0.07 (0.33)
Any physician services, %	68.42	71.27	60.74	62.41
Intensity, times per month	2.11 (2.70)	2.34 (2.96)	1.57 (2.34)	1.74 (2.65)

Notes:

- (1) Frequencies not conditional on service use.
- (2) Frequencies limited to the maximum of one event per day for the following outcomes because multiple events on the same day are not identifiable in the claims data: ER visits without hospitalization; physician services.
- (3) Column 2 in this exhibit is corresponding to Column 2 in Exhibits 2-7 and 2-8.

Appendix Exhibit 1-2. Results of Investigation on Parallel Trends During the Pre-Period (2008)

Outcome	Coefficient Estimate for Treatment*2008Q1 (95% CI)	Coefficient Estimate for Treatment*2008Q2 (95% CI)	Coefficient Estimate for Treatment*2008Q3 (95% CI)	P-Value from F-Test
Any Elderly Waiver HCBS, %	1.55 (-0.48 to 3.58)	0.84 (-0.45 to 2.13)	0.60 (0.00 to 1.19)	0.003
Elderly Waiver HCBS (i.e., HCBS added in managed care for the treatment group in the post-period):				
Any companion services, %	-0.22 (-0.50 to 0.05)	-0.16 (-0.90 to 0.57)	0.15 (-0.28 to 0.58)	0.092
Intensity, minutes per month	-1.92 (-9.04 to 5.20)	2.08 (-7.37 to 11.54)	7.22 (1.13 to 13.31)	0.002
Any home-delivered meals, %	0.47 (-0.96 to 1.90)	1.07 (-0.86 to 2.99)	1.22 (-0.89 to 3.32)	0.687
Intensity, times per month	0.56 (-0.15 to 1.28)	0.74 (-0.05 to 1.53)	0.81 (0.00 to 1.62)	0.254
Any homemaker services, %	2.79 (-1.54 to 7.11)	3.07 (-0.40 to 6.54)	1.16 (-1.33 to 3.65)	0.090
Intensity, minutes per month	29.51 (-62.13 to 121.14)	32.19 (-35.99 to 100.36)	37.43 (-31.49 to 106.35)	0.505
Any adult day care, %	0.39 (-1.01 to 1.80)	1.39 (-0.46 to 3.24)	0.08 (-0.86 to 1.01)	0.014
Intensity, minutes per month	-7.18 (-71.16 to 56.79)	35.21 (-21.19 to 91.61)	35.84 (3.38 to 68.31)	0.006
Any assisted living, %	1.10 (-0.28 to 2.47)	2.54 (-0.15 to 5.23)	2.14 (-1.60 to 5.88)	<0.001
Any non-medical transportation, %	0.20 (-1.48 to 1.88)	0.92 (-0.51 to 2.34)	0.07 (-1.18 to 1.32)	0.290
Intensity, times per month	-0.97 (-1.44 to -0.50)	-0.52 (-0.94 to -0.10)	-0.26 (-0.69 to 0.17)	<0.001
Non-Elderly Waiver HCBS (i.e., HCBS already covered in managed care for both groups before the pre-period):				
Any home health, %	1.59 (-1.01 to 4.20)	0.68 (-2.65 to 4.01)	0.09 (-3.17 to 3.34)	0.577
Any home health homemaker services, %	-1.23 (-3.86 to 1.40)	-0.19 (-2.56 to 2.19)	-0.30 (-3.35 to 2.74)	0.723
Intensity, minutes per month	-26.09 (-81.84 to 29.66)	-10.50 (-48.13 to 27.13)	-7.57 (-47.55 to 32.41)	0.668
Any non-homemaker home health, %	2.37 (-0.04 to 4.78)	0.72 (-2.24 to 3.67)	0.23 (-1.54 to 2.00)	0.013
Any personal care, %	1.33 (0.28 to 2.38)	2.21 (0.26 to 4.16)	0.44 (-0.11 to 0.99)	0.085
Intensity, minutes per month	1653.04 (69.21 to 3236.86)	2123.67 (336.16 to 3911.18)	1646.83 (294.82 to 2998.83)	0.079
Combined Elderly Waiver and non-Elderly Waiver homemaker services:				
Any homemaker services, %	1.75 (-1.08 to 4.58)	3.02 (-0.57 to 6.61)	1.10 (-1.84 to 4.04)	0.019
Intensity, minutes per month	3.42 (-66.35 to 73.19)	21.68 (-36.39 to 79.76)	29.85 (-30.48 to 90.19)	0.275
Hospital and physician services:				
Any hospital inpatient stays, %	-0.12 (-0.91 to 0.67)	-0.47 (-1.34 to 0.40)	-0.67 (-1.41 to 0.07)	0.209
Intensity, times per month	-0.02 (-0.04 to -0.01)	-0.02 (-0.03 to -0.01)	-0.02 (-0.03 to 0.00)	<0.001
Any hospital outpatient visits, %	1.78 (-0.41 to 3.98)	2.80 (1.24 to 4.37)	1.05 (-0.26 to 2.36)	0.004
Intensity, times per month	0.02 (-0.01 to 0.06)	0.03 (0.00 to 0.05)	0.00 (-0.01 to 0.02)	0.151

Any ER Visits without Hospitalization, %	0.21 (-0.75 to 1.17)	0.21 (-0.84 to 1.25)	-0.68 (-1.58 to 0.21)	0.060
Intensity, times per month	0.00 (-0.02 to 0.02)	0.00 (-0.01 to 0.01)	-0.01 (-0.02 to 0.00)	0.038
Any physician services, %	2.00 (0.58 to 3.42)	4.02 (-0.54 to 8.57)	0.91 (-2.15 to 3.96)	0.031
Intensity, times per month	0.11 (-0.02 to 0.24)	0.07 (-0.14 to 0.27)	0.11 (0.02 to 0.20)	0.107

Notes:

- (1) Pre-period outcomes regressed on treatment and quarterly indicators, and their interactions, with the last quarter in the pre-period (2008Q4) as the reference quarter.
- (2) P-values from F-tests that coefficient estimates for all three treatment and quarterly interaction terms (Treatment*2008Q1, Treatment*2008Q2, and Treatment*2008Q3) jointly equaled to zero.
- (3) Frequencies not conditional on service use.
- (4) Frequencies limited to the maximum of one event per day for the following outcomes because multiple events on the same day are not identifiable in the claims data: ER visits without hospitalization; physician services.
- (5) Controlled for age, gender, race/ethnicity, marital status, Charlson Comorbidity Index, and county, and plan fixed effects.
- (6) Standard errors clustered at the county and insurer interaction level (32 clusters).

Appendix Exhibit 1-3. Difference-in-Differences Results Between Treatment (MSC(+)) vs. Comparison (MSHO) Group for LTSS Outcomes, 2008–2009, No Restriction of 12-Month HCBS Use in the Pre-Period on Study Population

Outcome	Unadjusted Pre-Period Treatment Group Mean (SD)	DID (95% CI)	P-Value
Any Elderly Waiver HCBS, %	44.23	-0.68 (-1.42 to 0.07)	0.075
Elderly Waiver HCBS (i.e., HCBS added in managed care for the treatment group in the post-period):			
Any companion services, %	4.96	0.12 (-0.34 to 0.58)	0.608
Intensity, minutes per month	41.69 (193.85)	0.17 (-3.53 to 3.88)	0.925
Any home-delivered meals, %	9.52	-0.16 (-1.50 to 1.18)	0.810
Intensity, times per month	1.99 (6.51)	0.14 (-0.21 to 0.48)	0.428
Any homemaker services, %	21.40	-16.51 (-26.93 to -6.08)	0.003
Intensity, minutes per month	298.76 (811.80)	-245.18 (-402.88 to -87.49)	0.003
Any adult day care, %	13.26	0.07 (-1.41 to 1.54)	0.927
Intensity, minutes per month	433.51 (1255.95)	23.85 (-18.75 to 66.45)	0.263
Any assisted living, %	9.46	0.10 (-0.91 to 1.10)	0.845
Any non-medical transportation, %	14.72	-3.78 (-6.23 to -1.32)	0.004
Intensity, times per month	3.10 (10.25)	-2.54 (-3.63 to -1.46)	<0.001
Non-Elderly Waiver HCBS (i.e., HCBS already covered in managed care for both groups before the pre-period):			
Any home health, %	19.60	8.62 (2.55 to 14.70)	0.007
Any home health homemaker services, %	0.78	17.43 (5.94 to 28.91)	0.004
Intensity, minutes per month	7.49 (111.67)	266.95 (90.01 to 443.89)	0.004
Any non-homemaker home health, %	19.21	-0.37 (-1.53 to 0.79)	0.519
Any personal care, %	21.91	0.39 (-0.84 to 1.62)	0.519
Intensity, minutes per month	1315.84 (3192.66)	65.48 (-135.81 to 266.77)	0.513
Combined Elderly Waiver and non-Elderly Waiver homemaker services:			
Any homemaker services, %	22.12	0.55 (-1.34 to 2.43)	0.560
Intensity, minutes per month	306.25 (816.97)	21.77 (-6.32 to 49.85)	0.124
Any HCBS services, %	56.77	-0.32 (-1.54 to 0.89)	0.591
Any FFS nursing facility care, %	10.37	1.02 (-0.19 to 2.22)	0.095

Notes:

- (1) Frequencies not conditional on service use.
- (2) Controlled for age, gender, race/ethnicity, marital status, Charlson Comorbidity Index, and month, county, and plan fixed effects.
- (3) Standard errors clustered at the county and insurer interaction level (32 clusters).

Appendix Exhibit 1-4. Difference-in-Differences Results Between Treatment (MSC(+)) vs. Comparison (MSHO) Group for Hospital and Physician Services Outcomes, 2008–2009, No Restriction of 12-Month HCBS Use in the Pre-Period on Study Population

Outcome	Unadjusted Pre-Period Treatment Group Mean (SD)	DID (95% CI)	P-Value
Hospital and physician services:			
Any hospital inpatient stays, %	2.21	0.10 (-0.25 to 0.46)	0.558
Intensity, times per month	0.03 (0.20)	0.01 (0.00 to 0.01)	0.002
Any hospital outpatient visits, %	9.94	-0.54 (-2.12 to 1.05)	0.495
Intensity, times per month	0.14 (0.53)	-0.01 (-0.04 to 0.02)	0.541
Any ER Visits without Hospitalization, %	3.64	-0.04 (-0.49 to 0.41)	0.849
Intensity, times per month	0.05 (0.27)	0.00 (-0.01 to 0.00)	0.250
Any physician services, %	56.45	2.91 (1.21 to 4.62)	0.001
Intensity, times per month	1.57 (2.49)	0.09 (0.02 to 0.17)	0.018

Notes:

- (1) Frequencies not conditional on service use.
- (2) Frequencies limited to the maximum of one event per day for the following outcomes because multiple events on the same day are not identifiable in the claims data: ER visits without hospitalization; physician services.
- (3) Controlled for age, gender, race/ethnicity, marital status, Charlson Comorbidity Index, and month, county, and plan fixed effects.
- (4) Standard errors clustered at the county and insurer interaction level (32 clusters).

Appendix Exhibit 1-5. Difference-in-Differences Results Between Treatment (MSC(+)) vs. Comparison (MSHO) Group for LTSS Outcomes, 2008–2009, Restricted to Beneficiaries Without Support from Spouse

Outcome	Unadjusted Pre-Period Treatment Group Mean (SD)	DID (95% CI)	P-Value
Any Elderly Waiver HCBS, %	83.86	-0.83 (-2.19 to 0.52)	0.220
Elderly Waiver HCBS (i.e., HCBS added in managed care for the treatment group in the post-period):			
Any companion services, %	9.77	0.16 (-0.36 to 0.69)	0.530
Intensity, minutes per month	83.71 (270.11)	0.64 (-3.10 to 4.38)	0.728
Any home-delivered meals, %	18.79	-0.82 (-3.21 to 1.57)	0.490
Intensity, times per month	3.95 (8.82)	0.16 (-0.48 to 0.80)	0.619
Any homemaker services, %	40.52	-30.35 (-47.70 to -12.99)	0.001
Intensity, minutes per month	570.81 (1058.76)	-453.88 (-733.43 to -174.34)	0.002
Any adult day care, %	22.25	-1.20 (-3.14 to 0.74)	0.215
Intensity, minutes per month	733.09 (1578.78)	-0.21 (-50.93 to 50.52)	0.993
Any assisted living, %	20.29	-0.34 (-3.09 to 2.40)	0.801
Any non-medical transportation, %	25.50	-6.94 (-11.56 to -2.31)	0.005
Intensity, times per month	5.63 (14.14)	-4.62 (-6.21 to -3.02)	<0.001
Non-Elderly Waiver HCBS (i.e., HCBS already covered in managed care for both groups before the pre-period):			
Any home health, %	36.87	13.76 (5.22 to 22.29)	0.003
Any home health homemaker services, %	1.60	30.94 (12.63 to 49.24)	0.002
Intensity, minutes per month	13.58 (136.92)	505.83 (196.45 to 815.22)	0.002
Any non-homemaker home health, %	36.03	0.36 (-1.60 to 2.32)	0.712
Any personal care, %	36.11	0.10 (-1.34 to 1.54)	0.884
Intensity, minutes per month	2296.40 (4089.15)	-14.06 (-463.87 to 435.76)	0.950
Combined Elderly Waiver and non-Elderly Waiver homemaker services:			
Any homemaker services, %	42.00	-0.08 (-3.22 to 3.06)	0.960
Intensity, minutes per month	584.39 (1060.72)	51.95 (4.19 to 99.71)	0.034

Notes:

- (1) Frequencies not conditional on service use.
- (2) Controlled for age, gender, race/ethnicity, marital status, Charlson Comorbidity Index, and month, county, and plan fixed effects.
- (3) Standard errors clustered at the county and insurer interaction level (32 clusters).

Appendix Exhibit 1-6. Difference-in-Differences Results Between Treatment (MSC(+)) vs. Comparison (MSHO) Group for Hospital and Physician Services Outcomes, 2008–2009, Restricted to Beneficiaries Without Support from Spouse

Outcome	Unadjusted Pre-Period Treatment Group Mean (SD)	DID (95% CI)	P-Value
Hospital and physician services:			
Any hospital inpatient stays, %	2.69	0.12 (-0.53 to 0.76)	0.714
Intensity, times per month	0.03 (0.22)	0.01 (0.00 to 0.02)	0.042
Any hospital outpatient visits, %	11.51	-1.24 (-3.79 to 1.30)	0.328
Intensity, times per month	0.17 (0.56)	-0.02 (-0.06 to 0.03)	0.486
Any ER Visits without Hospitalization, %	4.27	0.21 (-0.56 to 0.99)	0.579
Intensity, times per month	0.05 (0.28)	0.00 (-0.01 to 0.01)	0.749
Any physician services, %	65.75	1.56 (-0.88 to 4.00)	0.201
Intensity, times per month	2.06 (2.76)	0.11 (0.02 to 0.19)	0.017

Notes:

- (1) Frequencies not conditional on service use.
- (2) Frequencies limited to the maximum of one event per day for the following outcomes because multiple events on the same day are not identifiable in the claims data: ER visits without hospitalization; physician services.
- (3) Controlled for age, gender, race/ethnicity, marital status, Charlson Comorbidity Index, and month, county, and plan fixed effects.
- (4) Standard errors clustered at the county and insurer interaction level (32 clusters).

Appendix Exhibit 1-7. Difference-in-Differences Results Between Treatment (MSC(+)) vs. Comparison (MSHO) Group for LTSS Outcomes, 2008–2009, Frequencies Without the Top 5% Outliers

Outcome	Unadjusted Pre-Period Treatment Group Mean (SD)	DID (95% CI)	P-Value
Elderly Waiver HCBS (i.e., HCBS added in managed care for the treatment group in the post-period):			
Companion services, minutes per month	68.40 (238.92)	10.81 (-0.65 to 22.27)	0.064
Home-delivered meals, times per month	3.82 (8.66)	0.22 (-0.37 to 0.82)	0.444
Homemaker services, minutes per month	450.79 (902.19)	-393.26 (-577.31 to -209.20)	<0.001
Adult day care, minutes per month	691.20 (1410.04)	10.98 (-66.91 to 88.87)	0.776
Non-medical transportation, times per month	3.88 (7.66)	-2.86 (-4.20 to -1.51)	<0.001
Non-Elderly Waiver HCBS (i.e., HCBS already covered in managed care for both groups before the pre-period):			
Home health homemaker services, minutes per month	11.55 (132.42)	470.58 (224.05 to 717.12)	<0.001
Personal care, minutes per month	1944.24 (3640.11)	-567.68 (-1055.40 to -79.95)	0.024
Combined Elderly Waiver and non-Elderly Waiver homemaker services:			
Homemaker services, minutes per month	462.34 (906.39)	77.33 (-18.25 to 172.90)	0.109

Notes:

- (1) Frequencies not conditional on service use.
- (2) Controlled for age, gender, race/ethnicity, marital status, Charlson Comorbidity Index, and month, county, and plan fixed effects.
- (3) Standard errors clustered at the county and insurer interaction level (32 clusters).

Appendix Exhibit 2-1. Unadjusted Means of Outcomes in Treatment (MSC(+)) vs. Comparison (MSHO) Group, 2008–2009 (Part 1)

Outcome	Treatment Group Mean (SD)		Comparison Group Mean (SD)	
	Pre-Period (2008)	Post-Period (2009)	Pre-Period (2008)	Post-Period (2009)
Managed Care Nursing Facility (NF) Services:				
Any services after the first 90 days, for beneficiaries having managed care NF claims early in the year and having more than 90 NF days, %	28.80	51.22	34.32	33.16
Days of services after the first 90 days in a year, for beneficiaries having managed care NF claims early in the year and having more than 90 NF days	24.97 (60.25)	33.02 (42.85)	20.32 (36.03)	18.13 (34.34)

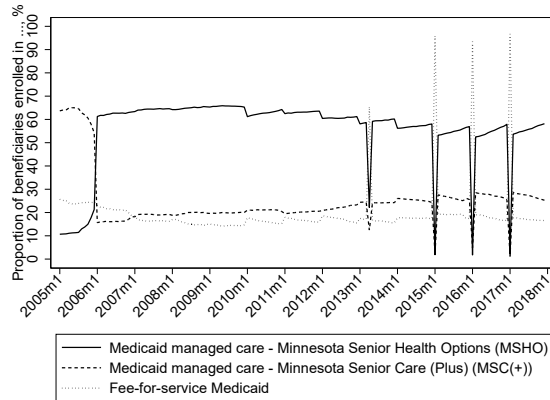
Note: NF services included both short-term (post-acute) and long-term care, which could not be differentiated in the data. However, the Medicaid managed care NF day cap applied to both post-acute and long-term care.

Appendix Exhibit 2-2. Unadjusted Means of Outcomes in Treatment (MSC(+)) vs. Comparison (MSHO) Group, 2008–2009 (Part 2)

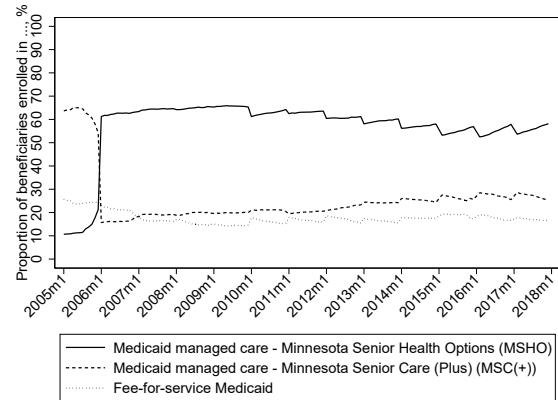
Outcome	Treatment Group Mean (SD)		Comparison Group Mean (SD)	
	Pre-Period (2008)	Post-Period (2009)	Pre-Period (2008)	Post-Period (2009)
Managed Care Nursing Facility (NF) Services:				
Any services during the year, %	8.55	8.57	14.98	14.06
Days of services in a year	4.76 (23.75)	4.94 (22.74)	6.87 (25.47)	6.42 (24.35)
Days of services in a year, conditional on any services	55.72 (61.38)	57.67 (54.81)	45.86 (50.43)	45.66 (49.25)
Days of services in a year, for beneficiaries having managed care NF claims early in the year	65.19 (66.82)	66.31 (61.61)	57.13 (57.55)	55.49 (55.16)
All (Managed Care and Fee-for-Service) NF Services:				
Days of services in a year	12.68 (58.36)	12.57 (58.70)	30.99 (95.59)	27.17 (88.88)
Days of services in a year, conditional on any services	148.30 (140.64)	146.75 (143.49)	206.87 (156.88)	193.20 (155.25)
Days of services in a year, for beneficiaries having managed care NF claims early in the year	174.91 (139.74)	174.32 (146.19)	231.23 (149.99)	224.35 (147.96)

Note: NF services included both short-term (post-acute) and long-term care, which could not be differentiated in the data. However, the Medicaid managed care NF day cap applied to both post-acute and long-term care.

Appendix Exhibit 3-1. Monthly Trends in Medicaid Managed Care Enrollment of Medicaid Older Adults in Minnesota, 2005–2017



(a) All Months



(b) Not Including April 2013 and January 2015, 2016, and 2017

Appendix Exhibit 3-2. Summary Statistics of Medicaid Older Adults (Age \geq 65) in Minnesota for Demographics, Enrollment of Medicare and Medicaid Programs, and Use of Hospital and Physician Services and Long-Term Services and Supports (LTSS), 2005–2017

	Year												
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
<i>N</i>	64,835	65,040	65,051	65,676	65,978	67,264	68,389	69,478	70,390	72,289	74,070	76,381	78,625
Demographics:													
Age, Mean (SD)	79.6 (9.1)	79.6 (9.2)	79.5 (9.2)	79.4 (9.3)	79.3 (9.3)	79.4 (9.5)	79.1 (9.5)	78.9 (9.6)	78.5 (9.6)	78.0 (9.7)	77.5 (9.6)	77.3 (9.6)	77.1 (9.5)
Female, %	71.9	71.6	71.4	71.0	70.5	69.8	69.4	69.2	68.6	68.1	67.3	66.8	66.1
Race: (column sum=100.0%)													
<i>Asian</i> , %	7.7	8.0	8.3	8.7	9.1	9.5	9.9	10.2	10.7	10.8	11.2	11.2	11.4
<i>Black</i> , %	5.6	6.1	6.7	7.0	7.5	8.1	8.6	9.1	9.8	10.4	11.2	11.7	12.3
<i>White</i> , %	81.5	80.6	79.5	78.6	77.7	76.5	75.5	74.5	73.2	72.1	70.4	69.6	68.6
<i>Others</i> , %	3.0	3.1	3.2	3.3	3.4	3.7	3.9	4.0	4.2	4.4	4.5	4.6	4.8
<i>Unknown</i> , %	2.2	2.2	2.2	2.3	2.3	2.2	2.1	2.1	2.1	2.3	2.7	2.9	3.0
Marital status: (column sum=100.0%)													
<i>Married and living with spouse</i> , %	5.3	5.6	6.1	6.7	7.5	8.4	9.3	10.3	11.3	12.1	13.7	12.2	13.4
<i>Not living with spouse</i> , %	94.7	94.4	93.8	93.2	92.5	91.6	90.3	88.6	86.8	85.2	82.9	83.7	82.1
<i>Unknown</i> , %	0.0	0.0	0.0	0.0	0.1	0.1	0.3	1.1	1.9	2.7	3.4	4.1	4.4
Living in the MSP metro area or not, %	46.6	47.3	48.1	48.3	49.0	49.9	50.7	51.6	52.5	53.4	54.5	55.0	55.5
Community or Institutional Living arrangement: (column sum=100.0%)													
<i>Community</i> , %	57.4	58.6	59.6	60.4	59.9	61.1	62.8	65.1	66.4	67.8	69.4	69.8	71.0
<i>Assisted living facilities</i> , %	7.5	8.2	8.6	9.6	11.1	11.6	11.5	10.4	10.7	10.8	10.7	10.9	10.9
<i>Nursing facilities</i> , %	34.5	32.7	31.3	29.5	28.6	26.9	25.2	24.0	22.4	20.9	19.4	18.8	17.6
<i>Other long-term inpatient facilities</i> , %	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Enrollment of Medicare and Medicaid Programs:													
Medicare-Medicaid dually eligible, %	96.2	95.8	95.6	95.7	95.9	95.8	95.8	95.6	95.2	93.6	92.3	92.5	92.3
Enrolled in Medicaid managed care, %	75.6	78.8	83.4	84.5	85.5	83.7	83.3	82.8	83.5	82.4	81.2	82.2	82.9
- <i>Minnesota Senior Health Options (MSHO)</i> , %	13.2	62.4	64.3	64.9	65.6	62.7	63.1	60.7	59.3	57.0	54.9	54.9	55.8
- <i>Minnesota Senior Care (Plus) (MSC(+))</i> , %	62.4	16.4	19.1	19.6	19.9	21.0	20.2	22.1	24.3	25.4	26.3	27.3	27.1
Medicaid waiver status: (column sum=100%)													
No waiver, %	72.6	68.1	65.0	62.6	60.5	59.1	57.7	57.4	56.8	57.3	57.8	57.0	56.2
Elderly Waiver (EW), %	25.6	30.0	32.9	35.1	37.0	37.6	38.7	38.7	38.9	38.1	37.0	37.2	37.5
Other waivers, %	1.8	1.9	2.0	2.3	2.5	3.3	3.6	3.9	4.3	4.7	5.2	5.8	6.3

Use of Hospital and Physician Services and Long-Term Services and Supports (LTSS) During the Year:													
Inpatient hospital, %	22.2	23.9	24.3	24.2	24.4	23.4	23.3	22.7	20.5	21.3	19.0	19.4	20.0
Outpatient hospital, %	42.1	41.6	42.2	41.3	43.9	48.8	49.6	50.6	50.1	52.3	51.8	51.2	50.4
Physician, %	79.7	84.3	85.7	86.2	86.1	86.3	86.2	86.3	85.8	86.4	85.6	85.4	83.2
LTSS: (column sum=100%)													
<i>No LTSS, %</i>	42.9	40.9	38.9	38.3	37.3	37.8	38.8	40.2	40.8	42.6	44.5	45.2	46.3
<i>Home and community-based services (HCBS) only, %</i>	33.1	37.9	40.3	42.3	44.1	45.1	45.6	45.8	46.4	46.6	46.1	45.7	46.4
<i>Nursing facility (NF) services only, %</i>	41.3	39.4	38.1	36.7	35.4	33.9	32.2	30.9	29.1	27.3	25.3	23.8	23.5
<i>Both HCBS and NF services, %</i>	5.4	6.4	6.7	6.4	7.0	7.3	7.6	7.3	6.9	7.0	6.3	6.4	6.2
HCBS:													
<i>Home health, %</i>	19.2	22.1	22.0	22.0	23.8	24.0	23.5	22.8	22.6	23.5	22.9	20.2	19.8
<i>Personal care, %</i>	7.4	8.3	9.2	10.1	11.0	11.6	11.7	11.8	12.5	12.9	13.4	13.9	14.4
<i>Companion, %</i>	1.1	1.1	1.1	1.2	1.3	1.4	1.3	1.3	1.3	1.2	1.1	1.1	1.1
<i>Home-delivered meals, %</i>	8.9	9.3	9.3	10.0	10.1	9.8	9.8	9.6	9.4	8.9	8.3	8.1	8.2
<i>Homemaker, %</i>	11.1	10.4	10.9	12.0	11.7	12.6	13.1	13.5	14.0	13.9	13.5	13.4	13.9
<i>Adult day care, %</i>	2.5	2.7	3.0	3.1	3.7	4.6	5.3	5.8	6.0	6.3	6.2	6.4	7.0
<i>Assisted Living, %</i>	10.7	12.3	13.1	14.4	15.3	15.9	16.4	16.5	16.7	16.8	16.2	16.3	16.4
<i>Non-medical Transportation, %</i>	1.7	2.1	2.5	3.4	4.3	5.6	6.4	7.0	7.8	8.2	8.1	8.3	8.8

Notes:

- (1) Demographics and enrollment of Medicare and Medicaid programs: weighted by enrollment months during the year of individual beneficiaries.
- (2) NF services may include short-term post-acute care, which could not be differentiated from NF long-term care in the data.
- (3) Home health may include homemaker services in some occasions.
- (4) The following months were excluded due to abruptly and temporarily high proportions of fee-for-service Medicaid beneficiaries among the study population in the data: April 2013 and January 2015, 2016, and 2017.

Appendix Exhibit 3-3. Summary Statistics for Use of Hospital and Physician Services and Long-Term Services and Supports (LTSS) of Medicaid Older Adults (Age \geq 65) in Minnesota, 2005–2017, Stratified by Age Group (Any Use During the Year)

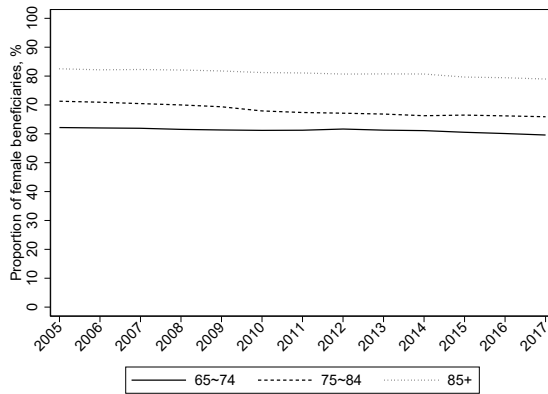
	Year												
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Group 1: Ages 65~74													
<i>N</i>	22,180	22,427	22,933	23,613	24,205	23,742	25,109	26,568	27,951	30,448	32,841	34,858	36,606
Inpatient hospital, %	21.2	21.9	22.0	22.0	22.7	22.3	21.7	21.4	19.0	19.5	17.3	17.8	18.1
Outpatient hospital, %	46.5	46.6	46.9	45.3	48.1	54.7	54.8	55.8	55.5	57.1	55.6	55.1	53.9
Physician, %	81.8	84.2	85.3	86.2	86.9	87.8	87.3	87.5	87.4	86.9	86.0	85.6	83.4
LTSS: (column sum=100%)													
<i>No LTSS, %</i>	66.4	64.4	61.4	59.9	57.6	59.2	60.3	61.5	62.0	64.0	65.8	66.3	66.5
<i>Home and community-based services (HCBS) only, %</i>	32.5	37.2	39.7	41.6	43.5	42.9	42.2	41.3	41.0	39.5	37.9	37.1	37.8
<i>Nursing facility (NF) services only, %</i>	16.7	16.2	15.9	15.3	15.0	14.2	13.6	13.2	12.7	12.2	11.4	10.9	10.9
<i>Both HCBS and NF services, %</i>	3.5	4.0	4.3	4.2	4.5	4.8	5.0	4.7	4.5	4.4	4.0	4.0	3.9
HCBS:													
<i>Home health, %</i>	21.0	25.1	23.9	23.8	26.1	25.5	24.4	22.6	22.1	22.5	20.9	18.0	17.9
<i>Personal care, %</i>	10.9	12.1	13.2	14.3	15.3	15.5	14.9	14.4	14.7	14.3	14.3	14.6	15.0
<i>Companion, %</i>	0.8	0.8	0.8	1.0	1.0	1.1	1.0	0.9	1.0	0.8	0.7	0.7	0.7
<i>Home-delivered meals, %</i>	8.4	9.2	9.5	10.7	11.0	10.7	10.8	10.6	10.3	9.3	8.6	8.5	8.9
<i>Homemaker, %</i>	11.0	10.6	11.6	12.9	13.3	14.4	15.0	15.3	15.3	14.4	13.4	13.2	13.9
<i>Adult day care, %</i>	2.8	3.1	3.5	3.8	4.7	5.9	6.7	7.1	7.2	7.0	6.4	6.5	7.1
<i>Assisted Living, %</i>	5.4	5.8	6.2	6.8	7.2	7.3	7.3	7.5	7.6	7.6	7.2	7.3	7.5
<i>Non-medical Transportation, %</i>	2.1	2.7	3.3	4.5	5.8	7.3	8.4	9.0	9.4	9.4	8.8	9.0	9.7
Group 2: Ages 75~84													
<i>N</i>	23,139	22,853	22,320	22,092	21,826	20,243	20,300	20,388	20,455	20,352	20,418	20,774	21,512
Inpatient hospital, %	22.5	24.2	24.8	24.1	24.0	24.9	24.9	24.4	22.3	23.2	20.8	21.7	22.1
Outpatient hospital, %	41.5	41.1	42.2	41.0	43.2	50.6	51.8	52.3	52.1	54.2	53.7	53.2	52.2
Physician, %	78.1	83.2	85.1	85.4	85.3	86.9	87.5	87.6	86.9	88.0	87.5	88.0	85.6
LTSS: (column sum=100%)													
<i>No LTSS, %</i>	40.5	38.2	35.4	34.0	32.8	34.7	34.5	34.8	34.4	34.3	34.7	34.3	35.3
<i>Home and community-based services (HCBS) only, %</i>	37.7	42.9	46.2	48.2	50.1	51.8	52.7	53.5	54.5	56.2	56.4	56.6	56.9
<i>Nursing facility (NF) services only, %</i>	38.9	36.7	35.1	34.2	32.8	31.0	29.7	28.8	27.2	26.3	24.9	24.0	24.3
<i>Both HCBS and NF services, %</i>	6.0	6.9	7.3	6.6	7.4	8.1	8.5	8.4	8.0	8.3	7.8	8.0	7.9
HCBS:													
<i>Home health, %</i>	22.2	24.8	25.4	25.5	27.3	28.5	28.4	27.8	27.6	29.3	28.9	26.2	24.6
<i>Personal care, %</i>	7.5	8.6	9.9	10.9	12.0	13.5	13.9	14.2	15.1	16.3	17.0	17.7	17.8

<i>Companion, %</i>	1.4	1.4	1.4	1.5	1.6	1.6	1.5	1.7	1.7	1.5	1.5	1.5	1.5
<i>Home-delivered meals, %</i>	10.7	11.0	11.2	11.9	12.0	11.7	11.5	11.5	11.1	11.0	10.2	9.5	9.3
<i>Homemaker, %</i>	13.8	12.7	13.6	14.9	14.1	15.7	16.4	16.8	17.7	18.4	18.0	18.0	18.1
<i>Adult day care, %</i>	3.1	3.4	3.8	3.9	4.4	5.9	6.9	7.6	8.1	8.8	8.9	9.0	9.7
<i>Assisted Living, %</i>	11.6	13.3	14.2	15.3	16.4	16.1	16.7	17.1	17.1	17.5	17.2	17.6	18.2
<i>Non-medical Transportation, %</i>	2.1	2.5	3.0	3.9	4.6	6.6	7.6	8.2	9.7	10.6	10.7	10.6	10.9
Group 3: Ages 85 and Above													
<i>N</i>	22,907	23,011	22,977	23,004	23,006	23,279	22,980	22,522	21,984	21,489	20,811	20,749	20,507
<i>Inpatient hospital, %</i>	20.0	22.8	23.4	23.8	23.7	23.1	23.8	22.6	20.7	22.0	19.9	20.0	21.1
<i>Outpatient hospital, %</i>	34.8	33.5	34.2	33.9	36.4	41.3	42.1	42.8	41.3	43.6	43.8	42.7	42.1
<i>Physician, %</i>	76.2	82.6	84.2	84.5	83.7	84.1	83.9	83.7	82.8	84.3	83.1	82.4	80.5
<i>LTSS: (column sum=100%)</i>													
<i>No LTSS, %</i>	20.6	18.9	17.9	18.5	18.2	18.8	19.0	20.0	19.6	20.2	20.5	20.8	22.0
<i>Home and community-based services (HCBS) only, %</i>	29.2	33.6	35.4	37.6	39.3	41.5	43.1	44.2	45.8	47.6	49.0	49.4	50.6
<i>Nursing facility (NF) services only, %</i>	66.6	63.7	62.0	60.1	58.7	56.4	54.7	53.7	51.6	49.7	47.6	45.3	45.2
<i>Both HCBS and NF services, %</i>	6.1	7.5	7.9	7.9	8.6	9.3	9.5	9.3	9.0	9.3	8.6	8.8	8.7
HCBS:													
<i>Home health, %</i>	14.2	15.8	16.0	16.1	17.4	18.5	18.3	18.6	18.4	19.7	20.0	18.1	18.1
<i>Personal care, %</i>	3.7	4.2	4.3	4.8	5.3	5.9	6.1	6.7	7.3	7.8	8.5	8.8	9.6
<i>Companion, %</i>	0.9	1.0	1.1	1.2	1.3	1.5	1.5	1.5	1.4	1.4	1.4	1.3	1.3
<i>Home-delivered meals, %</i>	7.4	7.5	7.0	7.3	7.4	7.2	7.1	6.7	6.7	6.4	6.0	5.9	5.8
<i>Homemaker, %</i>	8.5	7.7	7.7	8.1	7.8	8.1	8.2	8.4	8.8	9.1	9.2	9.0	9.3
<i>Adult day care, %</i>	1.5	1.6	1.7	1.7	1.9	2.2	2.3	2.6	2.7	3.0	3.4	3.6	4.0
<i>Assisted Living, %</i>	14.8	17.6	18.8	21.4	22.8	24.3	26.0	26.6	27.8	29.3	29.4	30.1	30.5
<i>Non-medical Transportation, %</i>	0.9	1.1	1.2	1.7	2.2	3.0	3.1	3.5	4.0	4.2	4.6	4.7	4.9

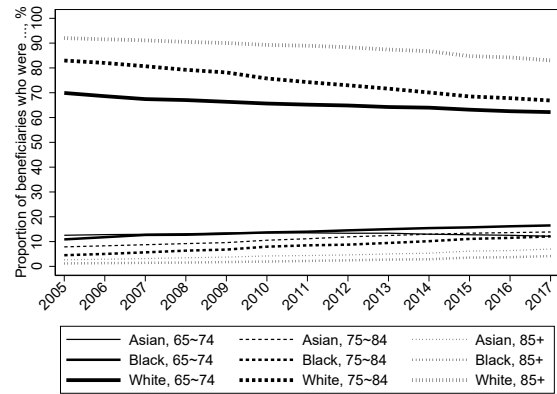
Notes:

- (1) NF services may include short-term post-acute care, which could not be differentiated from NF long-term care in the data.
- (2) Home health may include homemaker services in some occasions.
- (3) A beneficiary may belong to multiple groups during different periods of the year.
- (4) The following months were excluded due to abruptly and temporarily high proportions of fee-for-service Medicaid beneficiaries among the study population in the data: April 2013 and January 2015, 2016, and 2017.

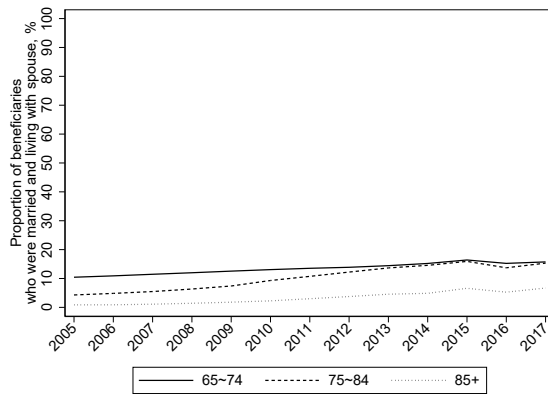
Appendix Exhibit 3-4. Trends in Demographics and Medicare–Medicaid Dual Eligibility of Medicaid Older Adults in Minnesota, 2005–2017, Stratified by Age Group



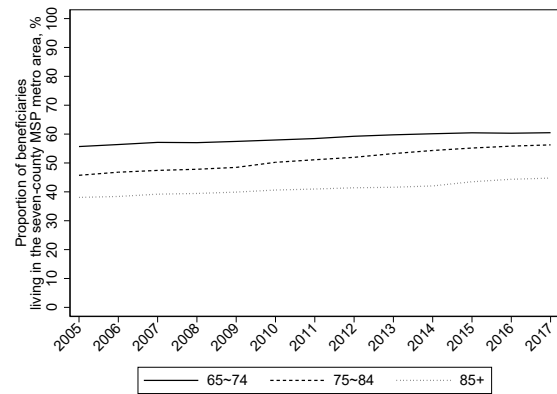
(a) Gender



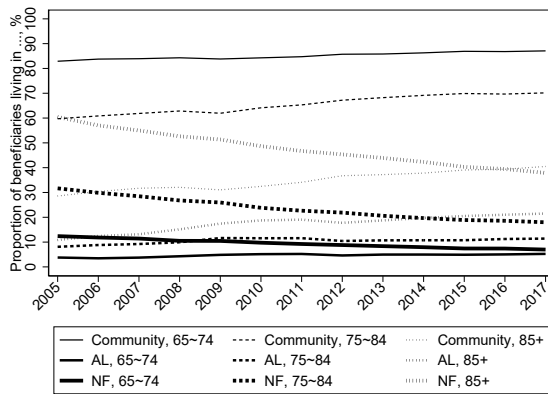
(b) Race



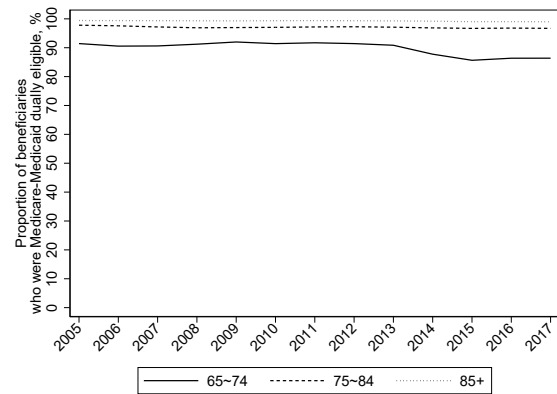
(c) Marital Status



(d) Living in the MSP Metro Area or Not



(e) Community or Institutional Living Arrangement



(f) Medicare-Medicaid Dual Eligibility

Notes:

- (1) Weighted by enrollment months during the year of individual beneficiaries.
- (2) The following months were excluded due to abruptly and temporarily high proportions of fee-for-service Medicaid beneficiaries among the study population in the data: April 2013 and January 2015, 2016, and 2017

Appendix Exhibit 3-5. Summary Statistics for Use of Hospital and Physician Services and Long-Term Services and Supports (LTSS) of Medicaid Older Adults (Age \geq 65) in Minnesota, 2005–2017, Stratified by Living in the Minneapolis-St. Paul (MSP) Metro Area or Not (Any Use During the Year)

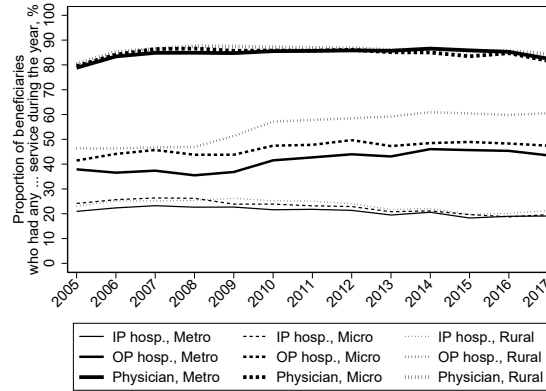
	Year												
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Group 1: Living in the MSP Metro Area													
<i>N</i>	30,058	30,512	30,873	31,400	31,873	33,043	34,112	35,296	36,385	37,922	39,717	41,326	42,833
Inpatient hospital, %	21.0	22.4	23.3	22.7	22.7	21.6	21.8	21.4	19.5	20.6	18.3	19.0	19.1
Outpatient hospital, %	37.9	36.6	37.4	35.5	36.8	41.5	42.7	44.0	43.1	46.1	45.7	45.4	43.5
Physician, %	78.9	83.4	84.9	84.9	84.8	85.6	85.7	85.8	85.7	86.6	85.9	85.3	82.5
LTSS: (column sum=100%)													
No LTSS, %	46.4	44.6	42.9	41.5	40.5	40.6	41.1	42.8	43.1	44.9	46.5	46.7	47.2
Home and community-based services (HCBS) only, %	34.9	39.8	42.3	44.3	46.8	48.1	49.0	49.1	49.6	49.9	49.4	49.5	50.5
Nursing facility (NF) services only, %	36.7	34.5	33.1	32.0	30.3	28.6	27.0	25.2	23.3	21.9	20.4	19.1	18.5
Both HCBS and NF services, %	4.7	5.7	6.0	5.7	5.9	6.4	6.7	6.3	5.9	6.3	5.7	5.8	5.7
HCBS:													
Home health, %	21.1	24.9	25.0	24.6	27.4	27.9	28.1	26.8	26.0	27.6	26.7	22.5	21.7
Personal care, %	12.4	13.8	15.1	16.3	17.9	18.7	18.7	18.7	19.3	19.8	20.2	20.7	21.4
Companion, %	0.8	0.9	0.9	1.0	0.9	1.1	1.0	1.1	1.0	0.9	1.0	0.8	0.9
Home-delivered meals, %	7.4	7.5	7.6	8.0	8.2	8.1	8.5	8.4	8.3	7.7	7.1	7.0	7.3
Homemaker, %	9.1	8.8	10.0	11.5	10.8	12.7	13.9	14.9	15.7	15.5	15.0	15.1	16.2
Adult day care, %	3.6	3.9	4.5	5.0	6.0	7.8	9.2	10.0	10.3	10.5	10.3	10.5	11.4
Assisted Living, %	8.9	11.1	11.8	12.4	13.0	13.2	13.7	13.7	13.7	13.9	13.3	13.7	13.9
Non-medical Transportation, %	2.6	3.2	3.9	5.0	5.9	7.9	9.6	10.5	11.7	12.1	11.9	12.2	13.1
Group 2: Not Living in the MSP Metro Area													
<i>N</i>	34,792	34,550	34,192	34,301	34,134	34,252	34,319	34,265	34,010	34,411	34,428	35,121	35,805
Inpatient hospital, %	23.2	25.3	25.3	25.5	25.9	25.0	24.8	24.0	21.6	22.0	19.8	19.9	21.0
Outpatient hospital, %	45.8	46.0	46.6	46.5	50.4	55.9	56.4	57.3	57.5	59.1	58.7	58.1	58.5
Physician, %	80.3	85.1	86.5	87.4	87.3	86.9	86.8	86.7	85.9	86.2	85.3	85.5	84.0
LTSS: (column sum=100%)													
No LTSS, %	39.9	37.6	35.2	35.3	34.3	35.2	36.5	37.6	38.3	40.2	42.2	43.6	45.3
Home and community-based services (HCBS) only, %	31.6	36.2	38.4	40.5	41.6	42.2	42.3	42.4	43.0	43.0	42.3	41.3	41.4
Nursing facility (NF) services only, %	45.3	43.7	42.5	41.0	40.3	38.9	37.4	36.7	35.2	33.2	30.9	29.3	29.6
Both HCBS and NF services, %	6.1	7.1	7.4	7.1	8.1	8.2	8.4	8.3	8.0	7.7	7.0	7.1	6.9
HCBS:													

<i>Home health, %</i>	17.5	19.6	19.3	19.6	20.5	20.2	19.0	18.7	18.8	19.1	18.4	17.6	17.4
<i>Personal care, %</i>	3.0	3.6	3.9	4.4	4.6	4.8	4.6	4.7	5.2	5.4	5.6	5.8	6.0
<i>Companion, %</i>	1.2	1.2	1.3	1.5	1.6	1.7	1.6	1.6	1.7	1.5	1.4	1.4	1.3
<i>Home-delivered meals, %</i>	10.2	10.8	10.7	11.9	11.9	11.5	11.0	10.8	10.6	10.3	9.7	9.3	9.3
<i>Homemaker, %</i>	12.8	11.8	11.8	12.5	12.6	12.6	12.2	12.0	12.1	12.2	11.8	11.3	11.1
<i>Adult day care, %</i>	1.5	1.5	1.6	1.4	1.5	1.6	1.4	1.4	1.5	1.7	1.6	1.6	1.7
<i>Assisted Living, %</i>	12.3	13.4	14.2	16.3	17.5	18.4	19.1	19.4	19.8	20.1	19.4	19.4	19.4
<i>Non-medical Transportation, %</i>	1.0	1.2	1.3	1.9	2.7	3.3	3.2	3.3	3.6	3.9	3.8	3.6	3.6

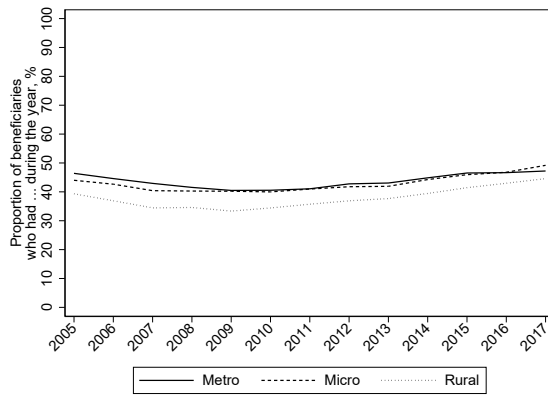
Notes:

- (1) NF services may include short-term post-acute care, which could not be differentiated from NF long-term care in the data.
- (2) Home health may include homemaker services in some occasions.
- (3) A beneficiary may belong to multiple groups during different periods of the year.
- (4) The following months were excluded due to abruptly and temporarily high proportions of fee-for-service Medicaid beneficiaries among the study population in the data: April 2013 and January 2015, 2016, and 2017.

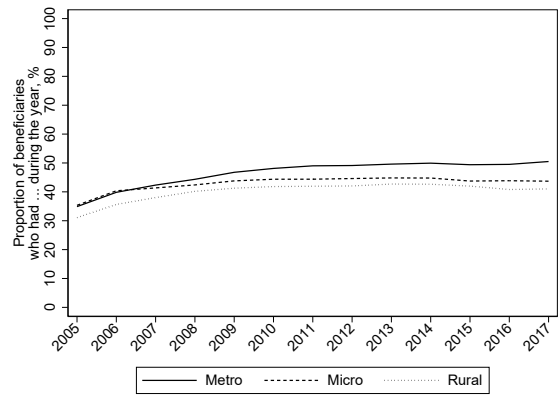
Exhibit 3-6. Trends in Hospital and Physician Services and LTSS Use of Medicaid Older adults in Minnesota, 2005–2017, Stratified by Metro vs. Micro vs. Rural Living Status



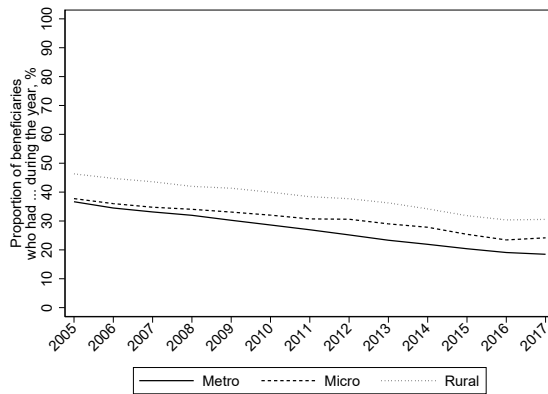
(a) Hospital and Physician Services



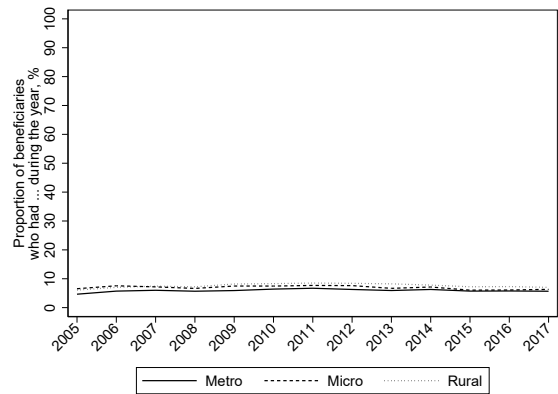
(b) No LTSS



(c) LTSS - HCBS Only



(d) LTSS - NF Services Only

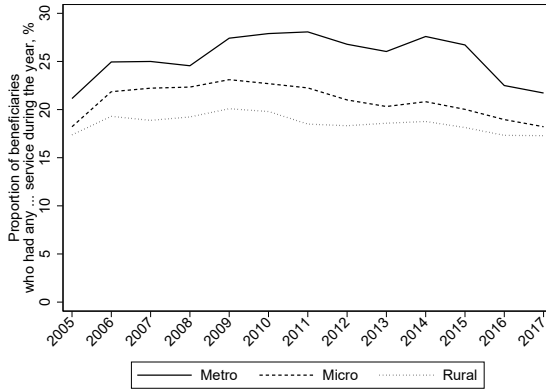


(e) LTSS - Both HCBS and NF Services

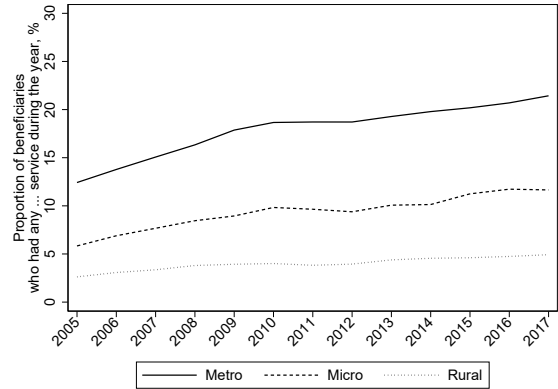
Notes:

- (1) NF services may include short-term post-acute care, which could not be differentiated from NF long-term care in the data.
- (2) The following months were excluded due to abruptly and temporarily high proportions of fee-for-service Medicaid beneficiaries among the study population in the data: April 2013 and January 2015, 2016, and 2017.

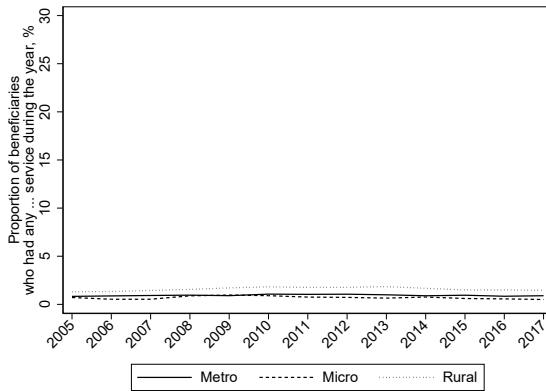
Exhibit 3-7. Trends in HCBS Use of Medicaid Older adults in Minnesota, 2005–2017, Stratified by Metro vs. Micro vs. Rural Living Status



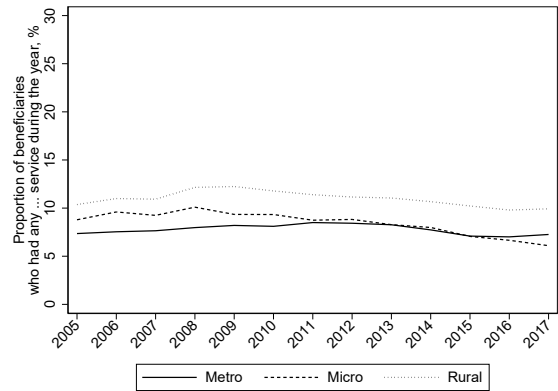
(a) Home Health



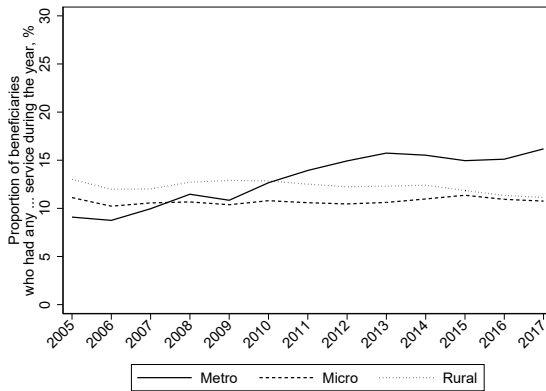
(b) Personal Care



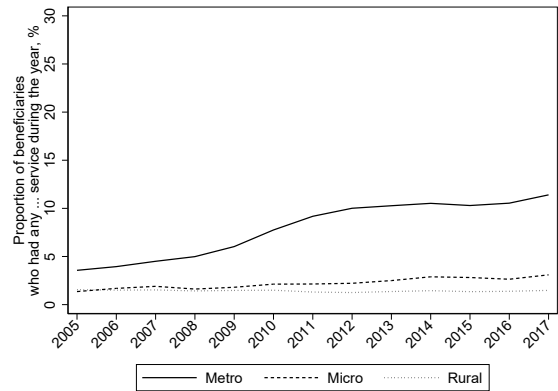
(c) Companion



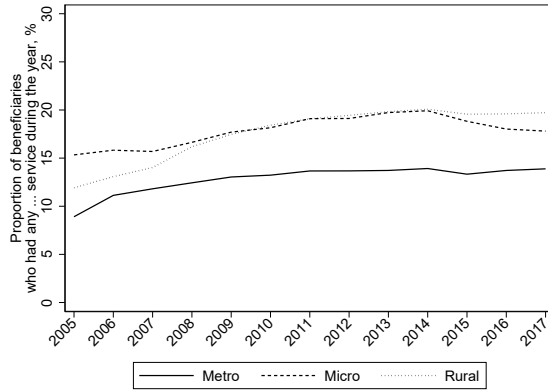
(d) Home-Delivered Meals



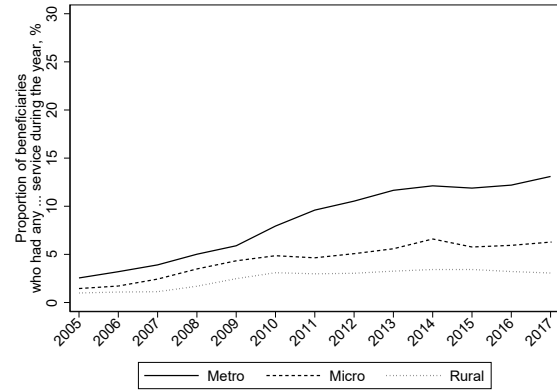
(e) Homemaker



(f) Adult Day Care



(g) Assisted Living



(h) Non-Medical Transportation

Notes:

- (1) Home health may include homemaker services in some occasions.
- (2) The following months were excluded due to abruptly and temporarily high proportions of fee-for-service Medicaid beneficiaries among the study population in the data: April 2013 and January 2015, 2016, and 2017.

Appendix Exhibit 3-8. Summary Statistics for Use of Hospital and Physician Services and Long-Term Services and Supports (LTSS) of Medicaid Older Adults (Age \geq 65) in Minnesota, 2005–2017, Stratified by Medicaid Managed Care Enrollment (Any Use During the Year)

	Year												
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Group 1: Medicaid Managed Care - Minnesota Senior Health Options (MSHO)													
<i>N</i>	13,091	41,483	41,998	42,816	43,053	42,843	42,959	42,227	41,939	41,421	41,041	42,591	44,192
Inpatient hospital, %	14.3	25.5	26.0	25.6	25.7	24.6	25.2	24.1	21.9	23.0	20.8	21.0	22.1
Outpatient hospital, %	33.3	44.7	44.9	43.4	46.5	51.9	53.3	53.8	53.0	55.7	55.7	54.9	56.5
Physician, %	82.6	93.7	94.5	95.0	94.7	94.3	94.6	94.5	93.8	94.6	94.3	94.1	93.9
LTSS: (column sum=100%)													
No LTSS, %	37.6	34.1	30.9	30.2	29.2	28.2	28.6	29.2	29.3	29.7	30.4	31.4	33.1
Home and community-based services (HCBS) only, %	35.5	37.0	41.2	43.9	46.3	47.5	49.1	49.8	51.2	52.7	53.3	53.0	53.7
Nursing facility (NF) services only, %	36.9	43.8	41.7	39.5	37.7	36.7	34.8	33.5	31.5	30.1	28.5	26.3	26.0
Both HCBS and NF services, %	3.4	6.4	7.1	6.9	7.7	8.2	8.7	8.4	8.2	8.2	7.8	7.8	7.8
HCBS:													
Home health, %	22.2	22.6	23.6	24.3	26.1	25.3	26.0	25.8	25.9	27.8	28.3	25.6	25.6
Personal care, %	9.7	7.9	9.1	10.3	11.5	10.8	11.4	11.8	12.6	13.3	13.9	14.4	15.1
Companion, %	0.6	1.0	1.1	1.2	1.2	1.5	1.5	1.6	1.6	1.4	1.5	1.4	1.5
Home-delivered meals, %	8.7	9.7	9.9	11.1	11.2	11.1	11.2	11.3	11.2	11.0	10.5	10.1	10.3
Homemaker, %	9.2	9.7	10.7	12.7	13.4	13.9	14.6	15.3	16.2	16.7	16.8	16.8	17.2
Adult day care, %	2.6	2.2	2.5	2.9	3.6	4.3	5.3	6.0	6.6	7.1	7.2	7.5	8.2
Assisted Living, %	6.7	9.9	11.3	13.5	14.8	16.2	16.9	17.1	17.5	17.9	17.6	17.7	17.6
Non-medical Transportation, %	0.6	1.5	1.7	2.8	4.2	5.5	6.7	7.6	8.6	9.4	9.3	9.5	10.0
Group 2: Medicaid Managed Care - Minnesota Senior Care (Plus) (MSC(+))													
<i>N</i>	42,770	16,116	16,555	16,423	15,878	16,795	16,216	18,338	19,865	21,127	23,197	24,879	25,030
Inpatient hospital, %	22.6	14.6	18.5	18.2	19.6	18.1	17.9	17.5	16.1	17.0	14.5	14.6	13.7
Outpatient hospital, %	46.3	32.5	36.6	35.5	38.7	44.8	45.0	45.9	46.8	49.5	47.5	47.1	41.7
Physician, %	87.6	75.6	79.3	80.3	81.3	84.0	83.2	83.1	83.5	84.1	82.2	82.2	74.1
LTSS: (column sum=100%)													
No LTSS, %	40.3	41.8	40.3	40.3	39.2	39.1	42.4	44.8	46.0	49.7	53.8	54.4	55.2
Home and community-based services (HCBS) only, %	29.3	38.4	43.4	44.2	45.8	47.7	45.2	42.6	42.9	41.0	38.3	37.6	37.8
Nursing facility (NF) services only, %	42.5	28.9	27.0	26.3	26.4	24.0	23.7	23.5	22.0	20.4	17.8	17.3	17.2
Both HCBS and NF services, %	4.4	3.0	4.3	4.0	4.8	4.6	4.3	4.2	4.0	4.1	3.4	3.2	2.8
HCBS:													

<i>Home health, %</i>	17.5	21.1	21.3	20.6	23.2	26.3	22.4	19.5	18.6	18.9	17.3	13.7	12.5
<i>Personal care, %</i>	7.2	12.2	12.1	12.4	13.6	18.3	16.9	15.5	16.2	15.8	15.8	16.6	16.9
<i>Companion, %</i>	1.2	1.4	1.4	1.6	1.7	1.6	1.2	1.1	1.1	1.0	0.8	0.8	0.7
<i>Home-delivered meals, %</i>	8.0	7.0	8.3	8.5	8.9	8.6	8.1	7.5	7.3	6.5	5.7	5.6	5.8
<i>Homemaker, %</i>	10.6	9.5	11.5	11.7	9.4	12.1	12.5	12.1	12.7	12.1	11.1	10.8	11.4
<i>Adult day care, %</i>	2.2	3.8	4.4	4.5	5.1	8.0	8.1	7.7	7.6	7.1	6.7	6.6	7.0
<i>Assisted Living, %</i>	8.2	11.6	15.5	14.8	14.9	12.4	12.3	11.9	11.8	11.6	10.4	9.9	9.8
<i>Non-medical Transportation, %</i>	1.9	3.7	5.0	5.5	5.3	8.2	8.3	7.9	8.5	8.4	8.1	8.1	8.3
Group 3: Fee-for-Service Medicaid													
<i>N</i>	28,756	24,796	22,172	21,799	19,346	20,589	20,903	21,992	21,100	22,438	23,385	24,256	23,863
<i>Inpatient hospital, %</i>	11.1	12.3	10.3	10.3	11.4	12.0	11.9	12.0	10.7	11.1	10.3	10.6	11.8
<i>Outpatient hospital, %</i>	17.1	20.1	18.0	18.0	19.9	22.6	25.2	26.5	25.7	27.2	27.8	26.5	26.4
<i>Physician, %</i>	39.8	45.1	41.2	39.7	41.0	44.5	45.8	46.2	45.9	48.3	47.9	46.1	45.8
<i>LTSS: (column sum=100%)</i>													
<i>No LTSS, %</i>	45.2	44.2	48.1	49.5	50.5	53.9	55.1	56.2	56.4	58.9	60.8	60.4	60.5
<i>Home and community-based services (HCBS) only, %</i>	31.8	35.7	31.6	31.4	30.8	31.6	31.4	31.4	32.0	31.4	30.8	30.9	31.7
<i>Nursing facility (NF) services only, %</i>	37.4	35.1	34.8	34.3	34.9	32.3	31.0	30.4	28.9	27.2	25.3	24.6	24.7
<i>Both HCBS and NF services, %</i>	4.6	4.6	3.6	3.2	3.3	3.6	3.9	3.7	3.5	3.8	3.3	3.7	3.5
HCBS:													
<i>Home health, %</i>	14.5	14.3	10.3	8.9	9.2	10.1	10.3	10.0	10.0	10.1	9.0	8.1	7.9
<i>Personal care, %</i>	4.6	5.0	5.1	6.2	5.6	5.8	5.0	5.3	5.0	5.1	5.5	5.2	5.4
<i>Companion, %</i>	0.7	0.5	0.4	0.4	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.3	0.3
<i>Home-delivered meals, %</i>	8.1	7.3	5.8	5.3	5.0	5.1	5.1	4.9	4.7	4.3	4.2	4.2	4.2
<i>Homemaker, %</i>	9.7	8.7	6.9	6.5	5.5	5.9	5.8	5.9	5.7	5.1	5.0	4.7	4.6
<i>Adult day care, %</i>	1.9	1.8	1.6	1.4	1.3	1.4	1.3	1.5	1.6	1.6	1.6	1.7	1.9
<i>Assisted Living, %</i>	14.4	18.0	15.4	15.0	16.3	16.7	17.7	17.6	18.4	18.5	17.8	18.4	19.2
<i>Non-medical Transportation, %</i>	1.3	1.4	1.4	1.5	1.6	1.8	1.9	2.2	2.4	2.5	2.9	3.0	3.3

Notes:

- (1) NF services may include short-term post-acute care, which could not be differentiated from NF long-term care in the data.
- (2) Home health may include homemaker services in some occasions.
- (3) A beneficiary may belong to multiple groups during different periods of the year.
- (4) The following months were excluded due to abruptly and temporarily high proportions of fee-for-service Medicaid beneficiaries among the study population in the data: April 2013 and January 2015, 2016, and 2017.