U.S. Department of Health and Human Services
Office of the Assistant Secretary for Planning and Evaluation
Office of Behavioral Health, Disability, and Aging Policy

Comparing Outcomes for Dual Eligible Beneficiaries in Integrated Care:

Final Report

September 2021

Office of the Assistant Secretary for Planning and Evaluation

The Assistant Secretary for Planning and Evaluation (ASPE) advises the Secretary of the U.S. Department of Health and Human Services (HHS) on policy development in health, disability, human services, data, and science; and provides advice and analysis on economic policy. ASPE leads special initiatives; coordinates the Department's evaluation, research, and demonstration activities; and manages cross-Department planning activities such as strategic planning, legislative planning, and review of regulations. Integral to this role, ASPE conducts research and evaluation studies; develops policy analyses; and estimates the cost and benefits of policy alternatives under consideration by the Department or Congress.

Office of Behavioral Health, Disability, and Aging Policy

The Office of Behavioral Health, Disability, and Aging Policy (BHDAP) focuses on policies and programs that support the independence, productivity, health and well-being, and long-term care needs of people with disabilities, older adults, and people with mental and substance use disorders.

NOTE: BHDAP was previously known as the Office of Disability, Aging, and Long-Term Care Policy (DALTCP). Only our office name has changed, not our mission, portfolio, or policy focus.

This report was prepared under contract #HHSP233201600021I between HHS's ASPE/BHDAP and Research Triangle Institute. For additional information about this subject, you can visit the BHDAP home page at https://aspe.hhs.gov/about/offices/bhdap or contact the ASPE Project Officer, at HHS/ASPE/BHDAP, Room 424E, H.H. Humphrey Building, 200 Independence Avenue, S.W., Washington, D.C. 20201; Jhamirah.Howard@hhs.gov.

COMPARING OUTCOMES FOR DUAL ELIGIBLE BENEFICIARIES IN INTEGRATED CARE: Final Report

Zhanlian Feng
Joyce Wang
Angela Gadaska
Molly Knowles
Susan Haber
Melvin J. Ingber
Valentina Grouverman

RTI International

September 2021

Prepared for
Office of Behavioral Health, Disability, and Aging Policy
Office of the Assistant Secretary for Planning and Evaluation
U.S. Department of Health and Human Services
Contract #HHSP233201600021I

CONTENTS

Exhibits

Acknowledgements

We would like to thank Dr. Edith G. Walsh for providing helpful comments on early drafts of this report.

Acronyms

The following acronyms are mentioned in this report and/or appendices.

AIDS	Acquired Immunodeficiency Syndrome
CMS	Centers for Medicare & Medicaid Services
D-SNP	Dual Eligible Special Needs Plan
ED	Emergency Department
ESRD	End-Stage Renal Disease
FAI	Financial Alignment Initiative
FFS	Fee-For-Service
FIDE-SNP	Fully Integrated Dual Eligible Special Needs Plan
GAO	U.S. Government Accountability Office
HCBS	Home and Community-Based Services
HCC	Hierarchical Condition Category
HIV	Human Immunodeficiency Virus
HMO	Health Maintenance Organization
IDR	Integrated Data Repository
LTSS	Long-Term Services and Supports
MA	Medicare Advantage
MACPAC	Medicaid and CHIP Payment and Access Commission
MedPAC	Medicare Payment Advisory Commission
MFFS	Managed Fee-For-Service
MLTSS	Managed Long-Term Services and Supports
MMP	Medicare-Medicaid Plan
MSC+	Minnesota Senior Care Plus
MSHO	Minnesota Senior Health Option
NF	Nursing Facility
OR	Odds Ratio
OREC	Original Reason for Entitlement Code

PACE	Program of All-inclusive Care for the Elderly
POS	Point of Service
SD	Standard Deviation
SNP	Special Needs Plan

EXECUTIVE SUMMARY

ES.1 Background

Dual eligible beneficiaries are an important subset of the Medicare and Medicaid populations because they have a high prevalence of chronic conditions and disabilities, substantial care needs, and high health care and long-term services and supports (LTSS) utilization and costs. The enrollment of dual eligible beneficiaries in managed care has grown significantly with the introduction of Medicare Advantage (MA) Dual Eligible Special Needs Plans (D-SNPs) that specifically target this population and of state-developed Medicaid managed long-term services and supports (MLTSS) plans or comprehensive Medicaid managed care plans that include LTSS.

Integrated care models have the potential to coordinate the administration, financing, and delivery of primary, acute, and behavioral health care, as well as LTSS across the Medicare and Medicaid programs, providing significant opportunities to improve care delivery and experience of care for dual eligible beneficiaries. Examples of integrated care models include the Program of All-Inclusive Care for the Elderly (PACE), Fully Integrated Dual Eligible Special Needs Plans (FIDE-SNPs), and D-SNPs, which have varying degrees of benefit integration and administrative alignment.

For policymakers, the ability to compare the quality of care and outcomes across the different models and determine their effectiveness is hindered by the lack of timely and accurate utilization data submitted by the managed care plans, referred to as encounter data. In 2019, the Centers for Medicare & Medicaid Services released the MA encounter data for 2015, the first year for which the nationwide Medicare encounter data on service use were considered to be reasonably complete and useable for research purposes.

In this study, we used Medicare encounter data from 2015 to analyze and compare selected measures of service utilization and outcomes for dual eligible beneficiaries enrolled in three types of integrated care models--D-SNPs, FIDE-SNPs, or PACE--relative to their counterparts enrolled in regular, non-integrated MA plans. Our analysis did not include beneficiaries in plans under the Financial Alignment Initiative demonstrations; their service use and outcomes are being evaluated separately and are beyond the scope of this study.

ES.2 Methods

Our study population included full-benefit dual eligible beneficiaries who were consistently enrolled in either a regular, non-integrated MA plan or one of three specific types of integrated care MA plan--D-SNPs, FIDE-SNPs, or PACE--for all months they were enrolled in Medicare and alive in 2015. These four plan types were mutually exclusive.

We created five dichotomous outcome measures pertaining to service use and mortality. All outcome measures were based on 2015 data.

- *Any inpatient hospitalization*: Whether a beneficiary had at least one inpatient hospital stay during the year.
- *Any emergency department (ED) visit*: Whether a beneficiary had at least one outpatient ED visit during the year that did not result in an inpatient admission.
- *Any institutional use*: Whether a beneficiary had any institutional use during the year (regardless of home and community-based services [HCBS] use). Institutional use includes Medicaid-covered stays in a nursing facility (NF), intermediate care facility, or inpatient psychiatric hospital.
- *HCBS use*: Whether a beneficiary had HCBS use (without institutional use). HCBS use includes services through waivers and state plans.
- *Mortality*: Whether a beneficiary died during the year.

We conducted descriptive statistical analyses to compare dual eligible beneficiaries enrolled in D-SNPs, FIDE-SNPs, PACE, and regular, non-integrated MA plans. Then, we used multivariate logistic regression models to estimate the independent association of enrollment in the different plan types with each of the outcome measures. We controlled for demographic characteristics and an indicator for each state to account for variations in state policies and other state-specific factors that were not measured but could influence the outcome. We also used Hierarchical Condition Categories (HCCs) from 2014 risk adjustment data to control for beneficiary comorbidities. Depending on the outcome measure, we also applied additional specific model criteria.

ES.3 Key Findings

- **Descriptive analyses show considerable differences in the demographic and health profiles of dual eligible beneficiaries across MA plan types in 2015:**
  - Beneficiaries in PACE were the oldest, on average, while those in D-SNPs were the youngest.
  - A greater proportion of beneficiaries in D-SNPs were originally or currently eligible for Medicare due to disability, than those in any other plan types.
  - Beneficiaries in PACE had the greatest number of comorbidities as measured by HCCs, followed by those in regular MA plans, then those in FIDE-SNPs, and finally those in D-SNPs. This same pattern holds when comparing their risk scores measured by the HCC system.
  - Beneficiaries in PACE had the highest mortality rate, while those in D-SNPs had the lowest mortality rate.

- **After controlling for demographics and disease burden, multivariate analysis results (*Exhibit ES-1*) indicate that in 2015, compared to beneficiaries in a regular MA plan:**
  - Beneficiaries in a D-SNP or PACE were less likely to be hospitalized, and those in FIDE-SNPs were more likely to be hospitalized.
  - Beneficiaries in a D-SNP or FIDE-SNP were more likely to visit the ED, while those in PACE were less likely to visit the ED.
  - Beneficiaries in a D-SNP, FIDE-SNP or PACE were much less likely to be institutionalized.
  - Beneficiaries in a D-SNP or FIDE-SNP were more likely to use HCBS.
  - Beneficiaries in a D-SNP or FIDE-SNP were less likely to die, while those in PACE were no more likely to die.

Exhibit ES-1. Multivariate regression associations between integrated care plan enrollment and service utilization and mortality among dual eligible beneficiaries in 2015, compared to a regular MA plan

	D-SNP	FIDE-SNP	PACE
Any inpatient hospitalization	– †	+ ††	– †
Any ED visit	+ ††	+ ††	– †
Any institutional use	– †	– †	– †
HCBS use	+ †	+ †	n/a
Mortality	– †	– †	–

– indicates *lower* odds of an outcome associated with an integrated plan type, compared to a regular MA plan.
+ indicates *higher* odds of an outcome associated with an integrated plan type, compared to a regular MA plan.
Legend:

†	= Favorable association, statistically significant ($p < 0.05$)
††	= Unfavorable association, statistically significant ($p < 0.05$)
n/a	= Not applicable (PACE excluded from regression model of HCBS use)
-	= Statistically not significant ($p > 0.05$)

ES.4 Discussion and Conclusion

Our findings indicate that after controlling for observed case-mix differences in terms of demographic characteristics and health conditions measured by a comprehensive set of HCCs, full-benefit dual eligible beneficiaries enrolled in any of the three integrated care models (D-SNPs, FIDE-SNPs, or PACE) were significantly less likely to be institutionalized than those in regular, non-integrated MA plans. Beneficiaries in FIDE-SNPs or D-SNPs are also more likely to use HCBS than those in regular MA plans. In general, less use of institutional care and more of HCBS are preferred by beneficiaries and are also intended policy goals. However, our finding of greater odds of any ED visits among beneficiaries in D-SNPs or FIDE-SNPs and of inpatient hospitalizations among beneficiaries in FIDE-SNPs, compared to those in regular MA plans, may suggest unmet care needs despite the HCBS they have received. For beneficiaries in D-

SNPs (many of whom are younger adults with disabilities), although they were institutionalized or hospitalized least frequently among all the MA plan types, they had the greatest odds of ED use. This may also indicate unmet needs among D-SNP enrollees at home and in the community, leading to more frequent use of ED services.

The PACE program, known for its focus on HCBS provision and full integration of a range of medical services and LTSS, stands out from our analysis as a consistently "high performer." We found that full-benefit dual eligible beneficiaries in PACE are significantly less likely to be hospitalized, to visit the ED, or be institutionalized, while their mortality risk is *not* significantly higher, compared to regular MA enrollees. PACE is designed to enroll people who have frailty levels qualifying for NF care, but who are treated at home as long as possible.

It is also noteworthy that beneficiaries in FIDE-SNPs or D-SNPs had significantly lower mortality risk than those in regular MA plans, after controlling for demographic characteristics and risk factors as measured by the HCCs. For beneficiaries in D-SNPs, their risk-adjusted low mortality risk might be attributable in part to unmeasured health characteristics of this population that were related to their relatively younger age but were not captured in the HCCs.

As the population of full-benefit dual eligible beneficiaries enrolled in MA plans continues to grow in years to come, it becomes increasingly more important to understand their service utilization patterns and outcomes across different types of MA plans with varying degrees of coordination and integration of Medicare and Medicaid services. With the advent of nationwide MA encounter data from 2015 and onward that has become reasonably reliable and useable, researchers and policymakers can begin to use these data to help address important policy questions surrounding the coordination and integration of care for the dual eligible population.

Results from our exploratory analysis of the 2015 MA encounter data show promising early evidence in support of the effectiveness of several types of MA integrated care models relative to non-integrated MA plans, including PACE, FIDE-SNPs, and D-SNPs, in reducing the use of Medicaid-covered institutional care while increasing the use of HCBS, which is an important intended policy goal. This favorable finding, however, was not always accompanied by reductions in the utilization of more costly hospital care--and indeed, we found increases in ED use by beneficiaries in FIDE-SNPs or D-SNPs and increases in inpatient hospitalization among beneficiaries in FIDE-SNPs, compared to those in regular, non-integrated MA plans. These findings may suggest that there exist unmet care needs among some beneficiaries in FIDE-SNPs and D-SNPs despite their greater use of HCBS. Our analysis did not find any adverse association of enrollment in any of the three integrated care models with mortality; enrollment in a FIDE-SNP or D-SNP could even be protective. Additional research, enhanced with more rigorous design and improved quality of the MA encounter data, is needed to validate our findings and to inform ongoing policy discussions in this area.

SECTION 1
BACKGROUND

1.1 Dual Eligible Beneficiaries

In 2019, 12.2 million individuals were eligible for both Medicare and Medicaid (CMS, 2020a). The majority of dual eligible beneficiaries were aged 65 or older, and 39% were people with disabilities under 65 (CMS, 2020a). Dual eligible beneficiaries receive coverage for their acute care medical services (e.g., hospital, physician, prescription drugs, and post-acute care) through Medicare. Medicaid provides financial assistance for their Medicare premiums and cost-sharing, as well as coverage for services not included in Medicare, such as long-term services and supports (LTSS) or behavioral health services.[1]

Dual eligible beneficiaries are an important subset of the Medicare and Medicaid populations because they have a high prevalence of chronic conditions and disabilities, substantial care needs, and high health care and LTSS utilization (Walsh et al., 2010). Dual eligible beneficiaries are among the highest cost enrollees in each program. In 2013, they accounted for 15% of Medicaid enrollees but 32% of total Medicaid expenditures. Similarly, they made up 20% of the Medicare population but accounted for 34% of total Medicare expenditures (MedPAC, 2018).

Historically, dual eligible beneficiaries received their Medicare and Medicaid services mostly through fee-for-service (FFS) arrangements. However, their enrollment in managed care has grown significantly with the introduction of Medicare Advantage (MA) Dual Eligible Special Needs Plans (D-SNPs) that specifically target this population (Verdier et al., 2016) and state-developed Medicaid managed long-term services and supports (MLTSS) plans. Between 2012 and 2018, enrollment of dual eligible beneficiaries in Medicare managed care grew from 23% to 40% (MedPAC, 2020). In 2018, 33% of dual eligible beneficiaries were enrolled in either an MLTSS plan or a comprehensive Medicaid managed care plan that may have included LTSS (CMS, 2018).

1.2 Integrated Care Models

Person-centered care delivery models that offer the full range of services in an integrated care system for dual eligible beneficiaries have been shown to help address the fragmentation of care associated with the lack of coordination of Medicare and Medicaid benefits, financing, and incentives (Anderson, Feng, & Long, 2016). Integrated care models have the potential to coordinate the administration, financing, and delivery of primary, acute, and behavioral health

[1] Different types of dual eligible beneficiaries receive different levels of Medicaid assistance. Full-benefit dual eligible beneficiaries receive the full range of Medicaid benefits offered in a given state along with Medicaid coverage of Medicare premiums and cost-sharing for Medicare services. Partial-benefit dual eligible beneficiaries only qualify for Medicaid assistance with Medicare premiums and may also pay the cost-sharing for Medicare services.

care, as well as LTSS, across the Medicare and Medicaid programs, providing significant opportunities to improve care delivery and experience of care for dual eligible beneficiaries.

Examples of integrated care models include the Program of All-Inclusive Care for the Elderly (PACE); Fully Integrated Dual Eligible Special Needs Plans (FIDE-SNPs); D-SNPs, which have varying degrees of benefit integration and administrative alignment; and the capitated and managed fee-for-service (MFFS) models under the Financial Alignment Initiative (FAI) demonstrations. As of 2018, over 800,000 dual eligible beneficiaries were receiving their Medicare and Medicaid services through one of these integrated care models (Medicare-Medicaid Coordination Office, 2018).

PACE is a provider-based model that serves people aged 55 or older who are eligible for state-determined nursing facility (NF) level of care but are able to live in the community with supports at the time of enrollment. PACE provides coordinated acute care, chronic care, and LTSS, with the goal of keeping enrollees in the community. The two primary model components of PACE are: (1) an adult day health center where enrollees receive medical care and social services, and (2) an interdisciplinary team comprised of medical care providers, social workers, nutritionists, therapists, personal care attendants, and drivers. Payment is capitated for both Medicare and Medicaid on a per-member per-month basis, providing an incentive to invest in medical care to improve or maintain health and reduce LTSS needs, and in LTSS to support health and reduce medical care needs. Total enrollment in PACE as of August 2020 was 49,357 beneficiaries in 137 programs in 31 states (Integrated Care Resource Center, 2020).

D-SNPs are a special type of MA plan that only serve dual eligible beneficiaries. They were first authorized in the Medicare Modernization Act of 2003 with the purpose of providing a coordinated Medicare and Medicaid benefit package and offering a higher level of integration than regular MA plans or traditional FFS Medicare. The Medicare Improvements for Patients and Providers Act of 2008--as amended by the Affordable Care Act--required all D-SNPs to have contracts with the Medicaid agencies in the states in which they operate. Although D-SNPs are required to coordinate the delivery of both Medicare and Medicaid services, the majority of these plans do not provide significant levels of care integration or administrative alignment. As of August 2020, 42 states and the District of Columbia had D-SNPs enrolling more than three million dual eligible beneficiaries (over 20% of the dual eligible population) (CMS, 2020a).

FIDE-SNPs are a specific type of D-SNP that focus on achieving a high degree of integration of Medicare and Medicaid services while contracting separately with the Centers for Medicare & Medicaid Services (CMS) for the Medicare-covered benefits and with states for the Medicaid-covered benefits. Authorized by the Affordable Care Act in 2010, FIDE-SNPs must "provide dually-eligible beneficiaries access to Medicare and Medicaid benefits under a single managed care organization."[2] In particular, FIDE-SNP contracts with states must include LTSS, and some eligible FIDE-SNPs receive additional frailty-adjusted payments. As of August 2020,

[2] Section 1853(a)(1)(B)(iv) of the Social Security Act and 42 CFR §422.2.

56 FIDE-SNPs were operating in ten states (Arizona, Idaho, Massachusetts, Minnesota, New Jersey, New York, Pennsylvania, Tennessee, Virginia, and Wisconsin), with a total national enrollment of 292,725 beneficiaries (CMS, 2020b).

CMS established the FAI in 2011 to allow states to test integrated care and financing models for dual eligible beneficiaries. CMS made two financial alignment models available to states: (1) a capitated model in which health plans coordinate the full range of health care services, and (2) a MFFS model in which states are eligible to benefit financially from savings resulting from initiatives that improve quality and reduce costs (Chepaitis, 2015). On April 24, 2019, CMS announced that states have three new opportunities available to test integrated care models for dual eligible beneficiaries, including the capitated financial model, the MFFS model, or a state-developed model (CMS, 2019). Our analysis did not include beneficiaries under the FAI; their service use and outcomes are being evaluated separately and are beyond the scope of this study.

1.3 Challenges with Determining Outcomes Across Integrated Care Models

For policymakers, the ability to compare across programs and determine their effectiveness is key when considering which programs should be further supported and expanded. While integrated care models provide the opportunity to improve care for dual eligible beneficiaries through coordination of care, several challenges exist when trying to compare the quality of care and outcomes across the different models.

These models vary in program design and populations targeted. PACE is a provider-based model for individuals aged 55 or older who qualify for NF level of care, an inherently frail population. D-SNPs are managed care organizations that target dual eligible beneficiaries, and the level of integration and coverage of Medicaid services vary by plan. FIDE-SNPs have more stringent integration requirements than D-SNPs and require a single managed care organization to coordinate both Medicare and Medicaid services and benefits, including LTSS. While LTSS is covered by all FIDE-SNPs, D-SNPs may choose to instead contract with separate MLTSS programs.

States also vary in their availability of home and community-based services (HCBS) programs, access to LTSS benefits, and types and levels of Medicaid services, which all may affect the care patterns of dual eligible beneficiaries. For example, states that offer fewer HCBS programs may have higher rates of NF admissions, regardless of the presence or effectiveness of integrated care programs. States also vary in their eligibility criteria to access LTSS with some states requiring stricter criteria such as higher levels of functional impairment among Medicaid beneficiaries to qualify for LTSS. These factors broadly impact the needs of the dual eligible population, and how much their care could be improved by integrated care programs. As a result of both the different composition of dual eligible beneficiaries across states and the varying levels of coverage, it is difficult to compare outcomes of individuals enrolled in programs across states.

Analysis of the patterns of service use and outcomes for beneficiaries in integrated care plans is dependent upon data submitted by the managed care plans, referred to as encounter data. The lack of timely, accurate, and integrated Medicare and Medicaid encounter data is a major barrier towards providing a complete picture of the entire spectrum of services provided dual eligible beneficiaries. Starting in 2012, all MA plans are required by CMS to provide Medicare encounter data. In 2019, CMS released the MA encounter data for 2015, the first year for which the nationwide Medicare encounter data on service use were made available for research use. However, the reporting of Medicaid FFS and encounter data is uneven across the states.

1.4 Objectives

In this study, we used Medicare encounter data from 2015 to analyze and compare selected measures of service utilization and outcomes for dual eligible beneficiaries enrolled in three types of integrated care models (Special Needs Plans [SNPs], FIDE-SNPs, and PACE) relative to their counterparts enrolled in regular, non-integrated MA plans. Thus, our analysis reflects the features of these integrated care models as of 2015, which might have evolved since then and differed somewhat from their current designs. Our analysis did not include beneficiaries who enrolled in Medicare-Medicaid Plans (MMPs) in 2015 under the FAI demonstrations; their service use and outcomes are being evaluated separately (CMS, 2020c) and beyond the scope of this study.

SECTION 2
METHODS

2.1 Data Sources

We used 2015 data from the CMS Integrated Data Repository (IDR) to identify our study population, including information on Medicare eligibility and enrollment, demographic characteristics, institutional or HCBS use, and mortality. To define measures of service utilization, including inpatient hospitalizations and outpatient emergency department (ED) visits, we used Medicare encounter data from 2015--the first year the encounter data were considered to be reasonably complete and useable for research purposes (Mulcahy et al., 2019). We applied a 4-year runout period through December 31, 2019, which ensured data completeness. In addition, we used 2014 Medicare risk adjustment data to obtain risk scores, Hierarchical Condition Categories (HCCs), and prior long-term institutional use.[3]

2.2 Study Population

We included full-benefit dual eligible beneficiaries who were consistently enrolled in either a regular, non-integrated MA plan or one of three specific types of integrated care MA plan--D-SNPs, FIDE-SNPs, or PACE--for all months they were enrolled in Medicare and alive in 2015.[4] These four plan types were mutually exclusive. We excluded beneficiaries who ever switched between different types of integrated care plans or between integrated and non-integrated plans during the year. We further excluded beneficiaries enrolled in an MMP under the FAI demonstrations.

2.3 Study Measures

We created five dichotomous outcome measures pertaining to service use and mortality. All outcome measures were based on 2015 data.

Any inpatient hospitalization. Using Medicare encounter data, we assessed whether a beneficiary had at least one inpatient hospital stay during the year.

Any ED visit. Using Medicare encounter data, we determined whether a beneficiary had at least one outpatient ED visit during the year that did not result in an inpatient admission.

Any institutional use or HCBS use. We started with a monthly IDR indicator of whether a beneficiary was institutionalized, not institutionalized, or used HCBS. Institutional use includes Medicaid-covered stays in an NF, intermediate care facility, or inpatient psychiatric hospital.

---

[3] We could only use 2014 risk adjustment data per our Data Use Agreement with CMS.

[4] Compared to the other integrated care models, the FIDE-SNPs were more concentrated among only a few states. As of December 2015, 36 FIDE SNPs were operating in seven states (Arizona, California, Idaho, Massachusetts, Minnesota, New York, and Wisconsin) with 65% of total FIDE-SNP enrollment in Massachusetts and Minnesota (CMS, 2015). Both Massachusetts and Minnesota limited their FIDE-SNP programs to dual eligible beneficiaries aged 65 or older. Please see Exhibit B-2 in the appendix for the state distribution of FIDE-SNP beneficiaries in our study population.

HCBS use includes services through waivers and state plans. We then created two separate, dichotomous indicators categorizing beneficiaries as those with any institutional use in at least one month (a small percentage of whom also used HCBS in at least one month) and those with HCBS use in at least one month but no institutional use in any month.

It should be noted that the eligibility for HCBS varies across states, with waivers covering specific geographic areas and different subpopulations. This adds variability to the use of HCBS. We tried to account for this variability by using control variables capturing state effects.

Mortality. Using the date of death from Medicare enrollment data in the IDR, we determined whether a beneficiary died during the year.

2.4 Statistical Analyses

We conducted descriptive statistical analyses to compare dual eligible beneficiaries enrolled in D-SNPs, FIDE-SNPs, PACE, and regular, non-integrated MA plans. We present descriptive statistics on the outcome measures and on beneficiary characteristics such as age, sex, race/ethnicity, original and current reason for Medicare eligibility, risk scores, and HCCs.

We used multivariate logistic regression models to examine the independent associations between enrollment in the different plan types and each of the dichotomous outcome measures in 2015, including any inpatient hospitalization, any ED visit, any institutional use (regardless of HCBS use), any HCBS use (without institutional use), and mortality. In all these models, we controlled for demographic characteristics and an indicator for each state to account for variations in state policies and other state-specific factors that were not measured but could influence the outcome. In addition, we included an indicator for beneficiaries with End-Stage Renal Disease (ESRD) dialysis status for at least one month in 2015, and an interaction term between an indicator for beneficiaries who originally became eligible for Medicare because of disability and another indicator for being aged 65 or older in 2015. Our study sample used for multivariate analysis was limited to beneficiaries with 2014 risk adjustment data, which we used to obtain HCC information; we controlled for HCCs in all models.

In the models predicting any inpatient hospitalization, any ED visit, and mortality, we also controlled for prior long-term institutional use in 2014. In all models except the mortality model, we further controlled for exposure time (i.e., proportion of months observed during the year, which was directly related to and highly correlated with death). In the mortality model, we excluded beneficiaries from three states (California, Oregon, and Utah) due to data irregularities. These states had mortality rates of less than 1%, which is far lower than expected for the study population. In the model predicting HCBS use, we excluded beneficiaries enrolled in PACE, because PACE is a program designed to enroll people who can be served at home while qualified for NF care and it is not part of state HCBS waiver programs.

The current reason for Medicare eligibility, count of HCCs, and risk scores are presented in descriptive tables only. Additional methodological details on the data sources, study sample, and variables are included in ***Appendix A***.

SECTION 3
RESULTS

In this section we first summarize descriptive results comparing the characteristics of the beneficiaries in D-SNPs, FIDE-SNPs, PACE, and regular, non-integrated MA plans. We then present multivariate analysis results on the associations of enrollment in each of the integrated care plan types with the outcome measures, compared to enrollment in a regular MA plan.

3.1 Descriptive Analysis Results

Select characteristics of the beneficiaries by plan type are shown in ***Exhibit 1***. Descriptive statistics on HCCs by plan type and distribution of the study population across states by plan type are included in ***Appendix B***. Not all characteristics or beneficiaries shown in ***Exhibit 1*** were included in multivariate analysis, due to missing information or other sample restrictions. Descriptive statistics for the sample included in regression models are also available in ***Appendix B***.

Across the different plan types, the characteristics of, and service use by, beneficiaries in the different plan types varied. In 2015, beneficiaries in PACE had the highest unadjusted inpatient hospitalization rate (21.77%) and mortality rate (11.20%), while those in D-SNPs had the lowest unadjusted hospitalization (17.74%) and mortality (2.72%) rates. The opposite is true when examining ED visits: 24.82% of beneficiaries in PACE had an ED visit, compared to 36.71% of beneficiaries in D-SNPs.

Using the indicators for institutional and HCBS status derived from IDR data, a greater proportion of beneficiaries in regular, non-integrated MA plans were institutionalized for some part of 2015 (24.62%), compared to any of the integrated care plan types. HCBS use was most common among beneficiaries in FIDE-SNPs (33.56%) but less so among those in D-SNPs (14.6%) or regular, non-integrated MA plans (16.24%).

In terms of demographic characteristics, beneficiaries in D-SNPs were the youngest on average (mean age = 65.12 years), while those in PACE were the oldest (mean age = 78.82 years). Accordingly, the percentage of beneficiaries aged 85 or older was lowest in D-SNPs (7.41%) and highest in PACE (32.95%). A greater percentage of beneficiaries in PACE (71.17%) and FIDE-SNPs (68.50%) were female than those in D-SNPs (62.54%) and in regular, non-integrated MA plans (66.06%). A greater proportion of beneficiaries in D-SNPs were racial/ethnic minorities and were originally or currently eligible for Medicare benefits because of disability, compared to those in any other plan type.

PACE beneficiaries had the highest average count of HCCs per beneficiary (3.84), followed by those in regular MA (2.87), then those in FIDE-SNPs (2.60), and finally those in D-SNPs (2.16). PACE beneficiaries also had the highest prevalence of most of the individual HCCs, compared to those in other plan types (see ***Appendix B***). This same pattern holds when comparing average 2014 community risk scores.

Exhibit 1. Characteristics of study population, by plan type					
Characteristic	**Regular MA**	**D-SNP**	**FIDE- SNP**	**PACE**	**TOTAL**
N (all beneficiaries, 2015)	435,968	779,411	95,637	26,884	1,337,900
Outcome measures, 2015:					
Any inpatient hospitalization, %	20.09	17.74	21.45	21.77	18.85
Any ED visit, %	30.72	36.71	31.24	24.82	34.13
Institutionalized in at least 1 month, %	24.62	2.19	17.60	6.41	10.69
HCBS use in at least 1 month but not institutionalized in any month, %	16.24	14.60	33.56	†	16.57
Died during year, %	9.45	2.72	8.68	11.20	5.51
Age, mean (SD)	72.13 (14.99)	65.12 (15.01)	76.81 (10.98)	78.82 (10.11)	68.51 (15.27)
Age, grouped:					
< 65, %	23.64	38.69	6.44	8.49	30.87
65-74, %	29.78	34.01	35.93	26.99	32.63
75-84, %	24.71	19.90	33.41	31.57	22.63
85+, %	21.87	7.41	24.22	32.95	13.83
Female, %	66.06	62.54	68.50	71.17	64.29
Race/ethnicity:					
White, non-Hispanic, %	60.98	45.70	61.21	59.37	52.06
Black, non-Hispanic, %	18.19	24.91	12.00	24.55	21.79
Hispanic, %	11.46	15.18	9.56	7.57	13.41
Asian, %	5.77	9.58	11.05	5.51	8.36
Other, %	3.60	4.63	6.18	3.00	4.37
Original reason for Medicare eligibility:					
Old age and survivors, %	62.70	49.14	75.07	67.86	55.79
Disability, %	36.85	50.44	24.80	31.50	43.79
ESRD, %	0.14	0.15	0.06	0.20	0.14
Both disability and ESRD, %	0.31	0.28	0.08	0.43	0.28
Current reason for Medicare eligibility:					
Aged without ESRD, %	75.60	60.97	92.94	89.66	68.60
Aged with ESRD, %	0.93	0.48	0.65	1.95	0.67
Disabled without ESRD, %	23.00	38.11	6.27	7.87	30.30
Disabled with ESRD, %	0.39	0.34	0.11	0.43	0.34

Exhibit 2. (*continued*)					
Characteristic	**Regular MA**	**D-SNP**	**FIDE- SNP**	**PACE**	**TOTAL**
ESRD only, %	0.08	0.10	0.02	0.09	0.09
ESRD dialysis status for at least 1 month in 2015, %	1.43	0.92	0.80	2.55	1.11
N (beneficiaries with 2014 risk scores and HCCs)	393,404	687,819	89,949	25,665	1,196,837
Community risk score, mean (SD)	1.66 (1.29)	1.25 (0.99)	1.59 (1.15)	2.15 (1.27)	1.43 (1.14)
Long-term institutional status for at least 1 month in 2014, %	21.10	1.10	14.23	7.51	8.67
Count of HCCs, mean (SD)	2.87 (2.64)	2.16 (2.16)	2.60 (2.44)	3.84 (2.72)	2.46 (2.39)
† Percentage of beneficiaries in PACE with any HCBS is not reported because HCBS delivered by PACE are not under the various Medicaid waiver programs. SOURCE: RTI analysis of MA encounter data (2015), Medicare enrollment and eligibility data (2015), and Medicare risk adjustment data (2014).					

3.2 Multivariate Analysis Results

In this section we present key results from multivariate logistic regression analysis of each outcome. We examined the independent association between enrollment in each type of integrated care plan, compared to enrollment in a regular, non-integrated MA plan, and a given outcome after controlling for all the covariates included in each model. We report the odds ratios (ORs) and 95% confidence intervals for each of the three integrated care plan types, the main predictor variable of interest in this study. Please see ***Appendix C*** for the full model results.

What are the associations between different integrated care plans and inpatient hospitalizations?

The logistic regression model results predicting any inpatient hospitalization are displayed in ***Exhibit 2*** and ***Exhibit 3***. PACE beneficiaries were significantly less likely to be hospitalized than those in regular MA (OR = 0.689; $p < 0.001$). Beneficiaries in D-SNPs were slightly less likely to be hospitalized compared to those in regular MA (OR = 0.970; $p < 0.001$). Beneficiaries in FIDE-SNPs were more likely to be hospitalized than those in regular MA (OR = 1.241; $p < 0.001$).

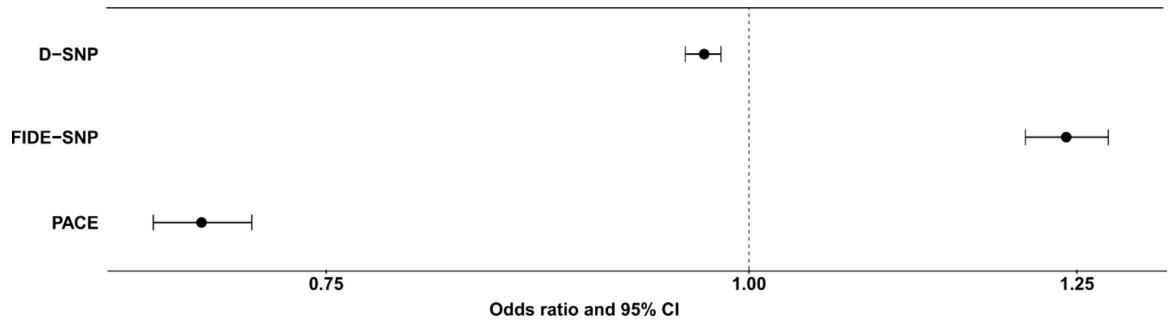
Exhibit 2. Logistic regression results predicting inpatient hospitalization in 2015				
Plan Type (Reference = Regular MA)	**Odds Ratio**		**95% Confidence Interval**	
D-SNP	0.970	***	0.958	0.981
FIDE-SNP	1.241	***	1.207	1.277
PACE	0.689	***	0.667	0.713

*/**/*** = Significantly different from regular MA plan based on a p-value cutoff of 0.05/0.01/0.001

NOTES: In addition to MA plan types, the full regression model also controlled for beneficiary demographic characteristics, current ESRD dialysis status, an interaction term between being originally eligible for Medicare because of disability and currently being aged 65 or older, prior long-term institutional use, exposure time (proportion of months observed during the year), HCCs, and an indicator for each state.

SOURCE: RTI analysis of MA encounter data (2015), Medicare enrollment and eligibility data (2015), and Medicare risk adjustment data (2014).

Exhibit 3. Association between integrated care plan enrollment and any inpatient hospitalization among dual eligible beneficiaries in 2015, compared to a regular MA plan



NOTES: In addition to MA plan types, the full regression model also controlled for beneficiary demographic characteristics, current ESRD dialysis status, an interaction term between being originally eligible for Medicare because of disability and currently being aged 65 or older, prior long-term institutional use, exposure time (proportion of months observed during the year), HCCs, and an indicator for each state.

SOURCE: RTI analysis of MA encounter data (2015), Medicare enrollment and eligibility data (2015), and Medicare risk adjustment data (2014).

What are the associations between different integrated care plans and ED visits?

As shown in ***Exhibit 4*** and ***Exhibit 5***, beneficiaries in D-SNPs and FIDE-SNPs were more likely to visit the ED at least once than beneficiaries in regular MA (OR = 1.160; $p < 0.001$ and OR = 1.141; $p < 0.001$, respectively). The opposite is true for beneficiaries in PACE; those in PACE were less likely to visit the ED (OR = 0.523; $p < 0.001$).

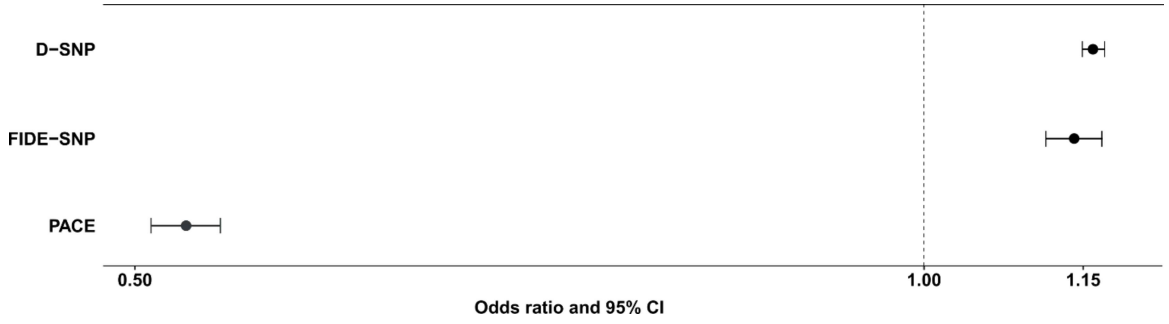
Exhibit 4. Logistic regression results predicting any ED visit in 2015				
Plan Type (Reference = Regular MA)	**Odds Ratio**		**95% Confidence Interval**	
D-SNP	1.160	***	1.149	1.172
FIDE-SNP	1.141	***	1.113	1.170
PACE	0.523	***	0.507	0.539

*/**/*** = Significantly different from regular MA plan based on a p-value cutoff of 0.05/0.01/0.001

NOTES: In addition to MA plan types, the full regression model also controlled for beneficiary demographic characteristics, current ESRD dialysis status, an interaction term between being originally eligible for Medicare because of disability and currently being aged 65 or older, prior long-term institutional use, exposure time (proportion of months observed during the year), HCCs, and an indicator for each state.

SOURCE: RTI analysis of MA encounter data (2015), Medicare enrollment and eligibility data (2015), and Medicare risk adjustment data (2014).

Exhibit 5. Association between integrated care plan enrollment and any ED visit among dual eligible beneficiaries in 2015, compared to a regular MA plan



NOTES: In addition to MA plan types, the full regression model also controlled for beneficiary demographic characteristics, current ESRD dialysis status, an interaction term between being originally eligible for Medicare because of disability and currently being aged 65 or older, prior long-term institutional use, exposure time (proportion of months observed during the year), HCCs, and an indicator for each state.

SOURCE: RTI analysis of MA encounter data (2015), Medicare enrollment and eligibility data (2015), and Medicare risk adjustment data (2014).

What are the associations between different integrated care plans and institutional and HCBS use?

We separately examined the association of integrated care plan enrollment with institutional use and with HCBS use as defined in the IDR. Institutional use includes Medicaid-covered stays in a NF, intermediate care facility, or inpatient psychiatric hospital. HCBS use includes services through Medicaid waivers and state plans. Regression results on institutional use are displayed in ***Exhibit 6*** and ***Exhibit 7***, and results from the HCBS model are presented in ***Exhibit 8*** and ***Exhibit 9***. Beneficiaries in D-SNPs are less likely to be institutionalized (OR = 0.127; $p < 0.001$) and more likely to use HCBS (OR = 1.046; $p < 0.001$), compared to those in regular MA. This same pattern holds when examining beneficiaries in FIDE-SNPs and their

institutional use (OR = 0.320; $p < 0.001$) and HCBS use (OR = 4.223; $p < 0.001$). Those in PACE are much less likely to be institutionalized (OR = 0.062; $p < 0.001$). PACE beneficiaries were excluded from the HCBS model because home-based care is the default treatment pattern for the program.

Exhibit 6. Logistic regression results predicting any institutional use in 2015

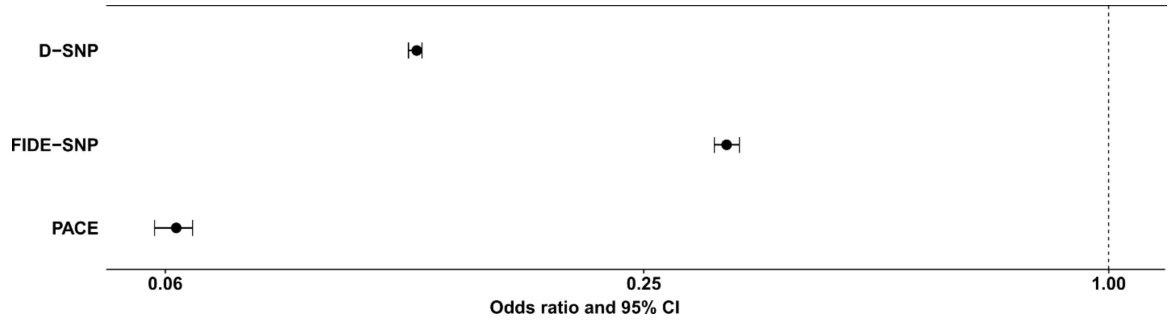
Plan Type (Reference = Regular MA)	Odds Ratio		95% Confidence Interval	
D-SNP	0.127	***	0.124	0.129
FIDE-SNP	0.320	***	0.308	0.332
PACE	0.062	***	0.058	0.065

*/**/*** = Significantly different from regular MA plan based on a p-value cutoff of 0.05/0.01/0.001

NOTES: In addition to MA plan types, the full regression model also controlled for beneficiary demographic characteristics, current ESRD dialysis status, an interaction term between being originally eligible for Medicare because of disability and currently being aged 65 or older, exposure time (proportion of months observed during the year), HCCs, and an indicator for each state.

SOURCE: RTI analysis of MA encounter data (2015), Medicare enrollment and eligibility data (2015), and Medicare risk adjustment data (2014).

Exhibit 7. Association between integrated care plan enrollment and any institutional use among dual eligible beneficiaries in 2015, compared to a regular MA plan



NOTES: In addition to MA plan types, the full regression model also controlled for beneficiary demographic characteristics, current ESRD dialysis status, an interaction term between being originally eligible for Medicare because of disability and currently being aged 65 or older, exposure time (proportion of months observed during the year), HCCs, and an indicator for each state.

SOURCE: RTI analysis of MA encounter data (2015), Medicare enrollment and eligibility data (2015), and Medicare risk adjustment data (2014).

Exhibit 8. Logistic regression results predicting any HCBS use in 2015				
Plan Type (Reference = Regular MA)	**Odds Ratio**		**95% Confidence Interval**	
D-SNP	1.046	***	1.033	1.060
FIDE-SNP	4.223	***	4.102	4.347

*/**/*** = Significantly different from regular MA plan based on a p-value cutoff of 0.05/0.01/0.001

NOTES: In addition to MA plan types, the full regression model also controlled for beneficiary demographic characteristics, current ESRD dialysis status, an interaction term between being originally eligible for Medicare because of disability and currently being aged 65 or older, exposure time (proportion of months observed during the year), HCCs, and an indicator for each state. The model excluded beneficiaries in PACE.

SOURCE: RTI analysis of MA encounter data (2015), Medicare enrollment and eligibility data (2015), and Medicare risk adjustment data (2014).

Exhibit 9. Association between integrated care plan enrollment and any HCBS use among dual eligible beneficiaries in 2015, compared to a regular MA plan

NOTES: In addition to MA plan types, the full regression model also controlled for beneficiary demographic characteristics, current ESRD dialysis status, an interaction term between being originally eligible for Medicare because of disability and currently being aged 65 or older, exposure time (proportion of months observed during the year), HCCs, and an indicator for each state. The model excluded beneficiaries in PACE.

SOURCE: RTI analysis of MA encounter data (2015), Medicare enrollment and eligibility data (2015), and Medicare risk adjustment data (2014).

What are the associations between the different integrated care plans and mortality?

As displayed in ***Exhibit 10*** and ***Exhibit 11***, beneficiaries in D-SNPs and FIDE-SNPs were significantly less likely to die in 2015 than beneficiaries in regular MA (OR = 0.578; $p < 0.001$ and OR = 0.694; $p < 0.001$, respectively). There was not a statistically significant difference in mortality between beneficiaries in PACE and those in regular MA (OR = 0.958; $p = 0.062$).

Exhibit 10. Logistic regression results predicting mortality in 2015

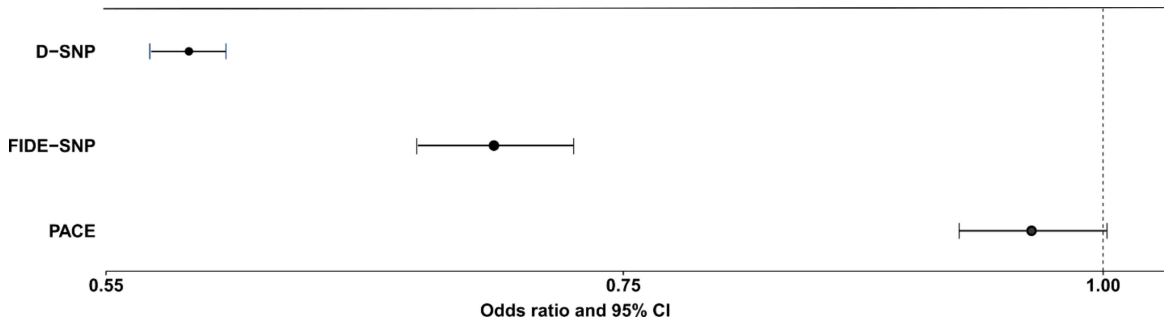
Plan Type (Reference = Regular MA)	Odds Ratio		95% Confidence Interval	
D-SNP	0.578	***	0.565	0.591
FIDE-SNP	0.694	***	0.663	0.728
PACE	0.958		0.917	1.002

*/**/*** = Significantly different from regular MA plan based on a p-value cutoff of 0.05/0.01/0.001

NOTES: In addition to MA plan types, the full regression model also controlled for beneficiary demographic characteristics, current ESRD dialysis status, an interaction term between being originally eligible for Medicare because of disability and currently being aged 65 or older, prior long-term institutional use, HCCs, and an indicator for each state. The model excluded beneficiaries from California, Oregon, and Utah.

SOURCE: RTI analysis of MA encounter data (2015), Medicare enrollment and eligibility data (2015), and Medicare risk adjustment data (2014).

Exhibit 11. Association between integrated care plan enrollment and mortality in 2015, compared to a regular MA plan



NOTES: In addition to MA plan types, the full regression model also controlled for beneficiary demographic characteristics, current ESRD dialysis status, an interaction term between being originally eligible for Medicare because of disability and currently being aged 65 or older, prior long-term institutional use, HCCs, and an indicator for each state. The model excluded beneficiaries from California, Oregon, and Utah.

SOURCE: RTI analysis of MA encounter data (2015), Medicare enrollment and eligibility data (2015), and Medicare risk adjustment data (2014).

SECTION 4
DISCUSSION

In this section we summarize and discuss the major findings of this analysis--the first of its kind--to compare utilization and health outcomes across integrated care models using nationwide MA encounter data from 2015, the first year considered to have reasonably complete and useable encounter data for research purposes (Mulcahy et al., 2019). Where possible, we compare our findings to the existing literature. However, the previous literature on this topic is scant, because most of the existing studies have compared service use and outcomes between traditional FFS Medicare and MA beneficiaries, and we did not identify any studies that have compared various integrated care models with regular, non-integrated MA plans using national data.

4.1 Summary of Key Findings

- **There are considerable differences in the health profile of full-benefit dual eligible beneficiaries across MA plan types. Beneficiaries in PACE programs had the greatest number of comorbidities as measured by HCCs, followed by those in regular MA, then those in FIDE-SNPs, and finally those in D-SNPs. This same pattern holds when comparing their risk scores.**

Consistent with our findings, other studies have also identified high rates of chronic conditions among PACE enrollees. For example, the average PACE enrollee has multiple acute and chronic medical conditions, such as heart or respiratory disease or diabetes (Hirth, Baskins, & Dever-Bumba, 2009) and PACE participants were more likely to be diagnosed with Alzheimer's disease or other forms of dementia compared to HCBS participants (42% and 29%, respectively) (Beauchamp et al., 2008).

The limited existing literature comparing chronic conditions in D-SNPs to other types of MA plans reports different findings from ours. In contrast to our findings, a Government Accountability Office (GAO) study found a higher prevalence of some chronic conditions among D-SNP and Medicare FFS beneficiaries compared to dual eligible beneficiaries enrolled in other MA plans. For example, the study found 15% of D-SNP enrollees were diagnosed with a chronic or disabling mental illness, such as major depressive disorder or schizophrenia, compared to 10% of dual eligible beneficiaries enrolled in other regular MA plans (GAO, 2012). Our study, using HCCs that group mental illness diagnoses differently (combining major depressive, bipolar, and paranoid disorders together and including schizophrenia separately), found less variation in prevalence across MA types.

- **After controlling for demographics and disease burden, beneficiaries in D-SNPs or PACE were less likely to be hospitalized, and those in FIDE-SNPs were more likely to be hospitalized, compared to those in regular MA plans.**

We were not able to identify other studies that compared hospitalization rates across integrated care models with regular MA plans. However, other studies found that D-SNP or FIDE-SNP enrollees had lower inpatient utilization compared to the Medicare FFS dual eligible population. For example, a descriptive analysis of D-SNP beneficiaries determined they averaged 2,821 inpatient days per 1,000 enrollees per year compared to 3,327 inpatient days per 1,000 enrollees per year for FFS dual eligible beneficiaries (Lewin Group, 2011). Another study found that preventable hospitalization rates among D-SNP enrollees were 14% lower and risk-adjusted hospital readmission rates were 25% lower than in Medicare FFS (Avalere, 2012). Anderson, Long & Feng (2020) found a significantly lower rate of inpatient hospital stays among enrollees in the Minnesota Senior Health Option (MSHO), a FIDE-SNP model, compared to enrollees in the Minnesota Senior Care Plus (MSC+), a Medicaid-only managed care plan with Medicare FFS. The literature also indicates that PACE enrollees are less likely to be hospitalized and spend fewer days in the hospital compared to control groups (Beauchamp et al., 2008; MedPAC, 2012; Segelman et al., 2014).

- **Based on multivariate analyses, beneficiaries in D-SNPs or FIDE-SNPs were more likely to visit the ED at least once, while those in PACE were less likely to visit the ED, compared to those in regular MA plans.**

Compared to our analyses, the findings related to ED use in the literature are mixed. We were not able to identify any studies that compared beneficiaries enrolled in integrated models to beneficiaries enrolled in regular MA plans. But among studies that analyzed ED use among integrated care programs, one study differed from our analysis and found that FIDE-SNP beneficiaries were 6% less likely to have an outpatient ED visit compared to dual eligible beneficiaries in Medicaid managed care (Anderson et al., 2016). Another study found that after adjusting for demographic characteristics and certain disease conditions, D-SNP enrollees had a 9% lower ED visit rate compared to Medicare FFS dual eligible beneficiaries (Murugan, Drozd, & Dietz, 2012). Consistent with our analysis, another study conducted a descriptive analysis and found ED use by D-SNP enrollees (919 ED visits per 1,000 enrollees per year) and by FIDE-SNP enrollees (917 ED visits per 1,000 enrollees per year) was higher compared to dual eligible beneficiaries in FFS (844 ED visits per 1,000 enrollees per year) (Lewin Group, 2011).

- **After risk-adjustment, beneficiaries in D-SNPs, FIDE-SNPs or PACE were much less likely to be institutionalized thanthose in regular MA plans.**

Previous studies of FIDE-SNP enrollees varied in NF utilization outcomes. Although we were not able to identify studies that compared integrated care programs with regular MA plans, one study of FIDE-SNP enrollees also determined that enrollment was associated with a 16% lower risk of long-stay NF admission after risk adjustment compared to the Medicare FFS dual eligible population (JEN Associates, 2013). However, unlike our analysis, another study (Anderson et al., 2020) found no significant difference in long-term NF use between enrollees in the MSHO, a FIDE-SNP model, and enrollees in the MSC+, a Medicaid-only managed care plan with Medicare FFS, after risk adjustment.

The literature also showed mixed findings on NF use among PACE enrollees. Unlike our analysis, one multivariate analysis (Beauchamp et al., 2008) and one descriptive study (Nadash, 2004) found that NF use was higher among PACE enrollees compared to HCBS participants and participants in Medicaid MLTSS plans. Conversely, other studies were consistent with our analyses and found that NF use was lower in PACE enrollees when compared to PACE eligible or HCBS waiver dual eligible beneficiaries after risk adjustment (MedPAC, 2012; Segelman et al., 2015).

- **Beneficiaries in FIDE-SNPs and D-SNPs were more likely to receive HCBS compared to those in regular MA plans.**

We did not identify any studies that compared HCBS utilization of dual eligible beneficiaries enrolled in integrated care programs with dual eligible beneficiaries enrolled in regular MA plans. However, one study of dual eligible beneficiaries in Minnesota found that enrollees in MSHO (a FIDE-SNP model) had greater use of primary care and HCBS than enrollees in MSC+ (a less integrated Medicaid-only managed care plan) after risk adjustment (Anderson et al., 2020).

- **Beneficiaries in D-SNPs or FIDE-SNPs were less likely to die than those enrolled in regular MA. There was no evidence that those in PACE were more or less likely to die, compared to those in regular MA plans.**

There is limited literature that examines similar mortality comparisons. One multivariate analysis that compared FIDE-SNP enrollees with FFS dual eligible beneficiaries determined that FIDE-SNP enrollees had a 17% lower risk of death compared to FFS beneficiaries (JEN Associates, 2013). Overall, studies of PACE enrollees found lower mortality rates compared to HCBS waiver enrollees and FFS dual eligible beneficiaries (Chatterji et al., 1998; Ghosh, Schmitz, & Brown, 2015; JEN Associates, 2015; Wieland et al., 2010).

4.2 Interpretations of Key Findings and Implications

Our findings indicate that after controlling for observed case-mix differences in terms of demographic characteristics and health conditions measured by a comprehensive set of HCCs, full-benefit dual eligible beneficiaries enrolled in any of the three integrated care models (D-SNPs, FIDE-SNPs, or PACE) were significantly less likely to be institutionalized than their counterparts in regular, non-integrated MA plans. Beneficiaries in FIDE-SNPs or D-SNPs are also more likely to use HCBS than those in regular MA plans. In general, less use of institutional care and more of HCBS are preferred by beneficiaries and are also intended federal policy goals (e.g., federal initiatives to support state efforts to rebalance LTSS such as Money Follows the Person program or the Balancing Incentive Program) (Musumeci & Reaves, 2014; CMS, n.d.). However, our finding of greater odds of ED visits among beneficiaries in D-SNPs or FIDE-SNPs and of inpatient hospitalizations among beneficiaries in FIDE-SNPs, compared to those in regular MA plans, may suggest unmet care needs of beneficiaries despite the HCBS they have

received. Based on descriptive data, beneficiaries in D-SNPs (many of whom are younger adults with disabilities) were institutionalized or hospitalized least frequently among all the MA plan types, but they visited the ED most frequently. This may also indicate unmet needs among D-SNP enrollees at home and in the community, leading to more frequent use of ED services.

The PACE program, well known for its focus on HCBS provision and full integration of a range of medical services and LTSS, stands out from our analysis as a consistently "high performer." We found that full-benefit dual eligible beneficiaries in PACE are significantly less likely to be hospitalized, to visit the ED, or be institutionalized, while their mortality risk is *not* greater despite their higher frailty levels, compared to regular MA enrollees.

It is also noteworthy that beneficiaries in FIDE-SNPs or D-SNPs had significantly lower mortality risk than those in regular MA plans, after controlling for demographic characteristics and risk factors as measured by the HCCs. For beneficiaries in D-SNPs, their risk-adjusted low mortality risk might be attributable in part to unmeasured health characteristics of this population that were related to their relatively younger age but were not captured in the HCCs.

Although we applied an extensive list of risk adjustment characteristics in the model to account for case-mix differences across plan types, there are always potentially unobserved factors that could account for some degree of estimated differences. For example, the D-SNP population is considerably younger and has a lower disease burden than other plan populations. We have adjusted for these differences. However, if severity of the diseases in the young population is less than that of older populations with the same conditions, we cannot measure that directly.

4.3 Usability of MA Encounter Data for Research and Policy

For years, the lack of reliable MA encounter data has been a major barrier for researchers, policymakers and other stakeholders to track health service utilization and outcomes for dual eligible beneficiaries in managed care plans in general and in various integrated care models in particular (Brennan, 2018; Creighton, Duddy-Tenbrunsel, & Michel, 2019). The recent release by CMS of the Research Identifiable File MA encounter data made this analysis possible. Our findings on inpatient hospitalizations and outpatient ED visits were based on MA encounter data for 2015, the first year for which the encounter data were considered to be reasonably complete and of acceptable quality, in line with data validation findings by others (Mulcahy et al., 2019). Using the beneficiary and MA contract or plan identification information on the 2015 encounter data, we were able to identify and classify beneficiaries into the three integrated care plan types of interest versus those in regular, non-integrated MA plans, and to link with their hospital inpatient and outpatient encounter data for comparison. As far as utilization of major health care services is concerned, such as hospital inpatient stays and ED visits, we consider the 2015 encounter data to be reasonably reliable for this analysis. Given the newness of these data and the scarcity of published studies using these data, we consider our study to be an exploratory analysis.

4.4 Limitations and Potential Areas for Future Research

In addition to potential issues about the quality of MA encounter data, we note several limitations of this study. First, although we controlled for beneficiary demographic information and a comprehensive set of HCCs as risk factors in our multivariate regression models, it is possible that unmeasured disease severity or frailty factors, together with the lack of functional impairment measures, could drive the residual differences in the observed outcomes and therefore potentially bias our estimated effects of integrated care plan types on each outcome.

Second, we identified a potential issue with the mortality data for our study population from three states (California, Oregon, and Utah), where the mortality rate in 2015 was unusually low relative to the national average. We were unable to ascertain whether the data were erroneous and opted to exclude beneficiaries in the three states from the mortality model. We note, however, all the other outcome measures appeared to be reasonable for beneficiaries in those three states. There could be reporting errors in the IDR data and this warrants further investigation.

Lastly, in this study we conducted a population based analysis that included the entire population of full-benefit dual eligible beneficiaries in 2015 who were in one of the three MA integrated care models or in a regular MA plan and met all other study inclusion criteria. This approach is appropriate for an exploratory analysis to compare beneficiary outcomes across the various MA plan types. Future research could be enhanced by selecting a comparison group of beneficiaries in regular, non-integrated MA plans who have similar characteristics and risk profiles to those in a given type of integrated care model and incorporating this comparison group in multivariate analysis. The comparison group selection should also take into consideration the fact that D-SNPs, FIDE-SNPs, and PACE programs are more concentrated in some states than others. Depending on sample sizes, the comparison group could be selected within states or among states with similar penetration of integrated care programs.

CMS and many states have prioritized improving care and reducing costs of care for dual eligible beneficiaries by supporting integrated care models. The recent proliferation of non-integrated care MA options, such as D-SNP “look-alike” plans, has come under state and federal scrutiny (CMS, 2019). Future research of outcomes among dual eligible beneficiaries enrolled in integrated care programs may provide policymakers additional support to address such non-integrated MA options that target dual eligible beneficiaries.

SECTION 5
CONCLUSION

As the population of full-benefit dual eligible beneficiaries enrolled in MA plans continues to grow, it becomes increasingly important to understand their service utilization patterns and outcomes across different types of MA plans with varying degrees of coordination and integration of Medicare and Medicaid services. With the advent of nationwide MA encounter data from 2015 and onward that has become reasonably reliable and useable, researchers and policymakers can begin to use these data to help address important policy questions surrounding the coordination and integration of care for the dual eligible population. Results from our exploratory analysis of the 2015 MA encounter data show promising early evidence in support of the effectiveness of several types of MA integrated care models, including PACE, FIDE-SNPs, and D-SNPs, in reducing the use of Medicaid-covered institutional care while increasing the use of HCBS waiver services, which is an important intended policy goal. This favorable finding, however, was not always accompanied by reductions in the utilization of more costly hospital care--and indeed, we found increases in ED use by beneficiaries in FIDE-SNPs or D-SNPs and increases in inpatient hospitalization among beneficiaries in FIDE-SNPs, compared to their counterparts in regular, non-integrated MA plans. These findings may suggest that there exist unmet care needs among some beneficiaries in FIDE-SNPs and D-SNPs despite their greater use of HCBS waiver services. Our analysis did not find any adverse association of enrollment in any of the three integrated care models with mortality; enrollment in a FIDE-SNP or D-SNP could even be protective. Additional research, enhanced with more rigorous design and improved quality of the MA encounter data, is needed to validate our findings and to inform ongoing policy discussions in this area.

REFERENCES

Anderson, W., Feng, Z., & Long, S. (2016). *Minnesota Managed Care Longitudinal Data Analysis*. RTI International. Retrieved July 29 from https://aspe.hhs.gov/reports/minnesota-managed-care-longitudinal-data-analysis-0.

Anderson, W.L., Long, S.K., & Feng, Z. (2020). Effects of integrating care for Medicare-Medicaid dually eligible seniors in Minnesota. *J Aging Soc Policy*, 32(1), 31-54. doi.org/10.1080/08959420.2018.1485396.

Avalere. (2012). *Dual Eligible Population Analysis for SCAN Health Plan: Hospitalizations and Readmissions*. Retrieved from https://www.nchc.org/wp-content/uploads/2016/04/20120401_scan-dual-eligibles-analysis_final_for-posting.pdf.

Beauchamp, J., Cheh, V., Schmitz, R., Kemper, P., & Hall, J. (2008). *The Effect of the Program of All-Inclusive Care for the Elderly (PACE) on Quality*. Mathematica Policy Research. https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Reports/downloads/beauchamp_2008.pdf.

Chatterji, P., Bustein, N.R., Kidder, D., & White, A. (1998). *Evaluation of the Program of All-Inclusive Care for the Elderly (PACE) demonstration: The impact of PACE on participant outcomes.* Retrieved from https://innovation.cms.gov/files/migrated-medicare-demonstration-x/evalpace-outcomeimpact.pdf.

Chepaitis, A., Greene, A.M., Hoover, S., Khatutsky, G., Lyda-McDonald, B., Ormond, C., Walsh, E., Zheng, N., Booth, M., Fralich, J., Justice, D., & Weiss, A. (2015). *Report on Early Implementation of the Demonstrations under the Financial Alignment Initiative*. https://www.cms.gov/Medicare-Medicaid-Coordination/Medicare-and-Medicaid-Coordination/Medicare-Medicaid-Coordination-Office/FinancialAlignmentInitiative/Downloads/MultistateIssueBriefFAI.pdf.

Centers for Medicare & Medicaid Services (CMS). (2015). *SNP Comprehensive Report--December 2015*. https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/MCRAdvPartDEnrolData/Special-Needs-Plan-SNP-Data-Items/SNP-Comprehensive-Report-2015-12.

Centers for Medicare & Medicaid Services (CMS). (2018). *Medicaid Managed Care Enrollment Report*. Retrieved from https://www.medicaid.gov/medicaid/managed-care/downloads/2018-medicaid-managed-care-enrollment-report.pdf.

Centers for Medicare & Medicaid Services (CMS). (2019). *State Medicaid Director Letter: Three New Opportunities to Test Innovative Models of Integrated Care for Individuals Dually Eligible for Medicaid and Medicare*. Retrieved from https://www.medicaid.gov/federal-policy-guidance/downloads/smd19002.pdf.

Centers for Medicare & Medicaid Services (CMS). (2020a). *Medicare-Medicaid Coordination Office: FY 2019. Report to Congress*. Retrieved from https://www.cms.gov/Medicare-Medicaid-Coordination/Medicare-and-Medicaid-Coordination/Medicare-Medicaid-Coordination-Office/Downloads/FY-2018-Report-to-Congress.pdf.

Centers for Medicare & Medicaid Services (CMS). (2020b). *SNP Comprehensive Report--August 2020*. Retrieved from https://www.cms.gov/research-statistics-data-and-systemsstatistics-trends-and-reportsmcradvpartdenroldataspecial-needs/snp-comprehensive-report-2020-08.

Centers for Medicare & Medicaid Services (CMS). (2020c). *Financial Alignment Initiative: Evaluations*. https://www.cms.gov/Medicare-Medicaid-Coordination/Medicare-and-Medicaid-Coordination/Medicare-Medicaid-Coordination-Office/FinancialAlignmentInitiative/Evaluations.

Centers for Medicare & Medicaid Services (CMS). (n.d.) *Balancing Long-Term Services and Supports*. https://www.medicaid.gov/medicaid/long-term-services-supports/balancing-long-term-services-supports/index.html.

Creighton, S., Duddy-Tenbrunsel, R., & Michel, J. (2019). *The Promise and Pitfalls of Medicare Advantage Encounter Data*. https://www.healthaffairs.org/do/10.1377/hblog20190221.696651/full/.

Government Accountability Office (GAO). (2012). *Medicare Special Needs Plans: CMS should improve Information available about Dual-Eligible Plans' Performance*. http://www.gao.gov/assets/650/648291.pdf.

Ghosh, A., Schmitz, R., & Brown, R. (2015). *Effect of PACE on Costs, Nursing Home Admissions, and Mortality: 2006-2011*. https://aspe.hhs.gov/reports/effect-pace-costs-nursing-home-admissions-mortality-2006-2011-0.

Hirth, V., Baskins, J., & Dever-Bumba, M. (2009). Program of All-Inclusive Care (PACE): Past, present, and future. *Journal of the American Medical Directors Association*, 10(3), 155-160. doi.org/10.1016/j.jamda.2008.12.002.

Integrated Care Resource Center. (2020). *Program of All-Inclusive Care for the Elderly (PACE) Total Enrollment by State and by Organization*.

JEN Associates. (2013). *Massachusetts Senior Care Option 2005-2010 Impact on Enrollees: Nursing Home Entry Utilization*. http://www.mass.gov/eohhs/docs/masshealth/sco/sco-evaluation-nf-entry-rate-2004-through-2010-enrollment-cohorts.pdf.

JEN Associates. (2015). *Massachusetts PACE Evaluation Nursing Facility Residency and Mortality Summary Report*. http://www.mass.gov/eohhs/docs/masshealth/pace/ma-pace-evaluation-nf-residency-and-mortality-summary-report-11-23-15.pdf.

Kaiser Family Foundation. (2014). *Medicaid Beneficiaries Who Need Home and Community-Based Services: Supporting Independent Living and Community Integration*. https://www.kff.org/wp-content/uploads/2014/03/8568-medicaid-beneficiaries-who-need-home-and-community-based-servcies.pdf.

Medicaid.gov. (2019). *2017 Managed Care Enrollment by Program and Population (Duals)*. Retrieved July 29 from https://data.medicaid.gov/Enrollment/2017-Managed-Care-Enrollment-by-Program-and-Popula/388z-vsy3.

Medicare Payment Advisory Commission (MedPAC). (2012). *Report to Congress: Chapter 3, Care Coordination Programs for Dual-Eligible Beneficiaries*. Retrieved from http://medpac.gov/docs/default-source/reports/jun12_ch03.pdf?sfvrsn=0.

Medicare Payment Advisory Commission (MedPAC). (2020). *A Data Book: Health Care Spending and the Medicare Program*. Retrieved from http://www.medpac.gov/docs/default-source/data-book/july2020_databook_entirereport_sec.pdf?sfvrsn=0.

Medicare Payment Advisory Commission (MedPAC), & Medicaid and CHIP Payment and Access Commission (MACPAC). (2018). *Beneficiaries Dually Eligible for Medicare and Medicaid Data Book*.

Mulcahy, A.W., Sorbero, M.E., Mahmud, A., Wilks, A., Gildner, J., Hornsby, A., & Pignotti, A. (2019). Measuring Health Care Utilization in Medicare Advantage Encounter Data: Methods, Estimates, and Considerations for Research. RAND Corporation. https://www.rand.org/pubs/research_reports/RR2681.html.

Murugan, V., Drozd, E., & Dietz, K. (2012). *A Comparison of the Mercy Care Plan Population to Nationwide Dual-Eligible Medicare Beneficiaries*. Avalere. http://avalere.com/research/docs/20120627_Avalere_Mercy_Care_White_Paper.pdf.

Nadash, P. (2004). Two models of managed long-term care: Comparing PACE with a Medicaid-only plan. *Gerontologist*, 44(5), 644-654. doi.org/10.1093/geront/44.5.644.

Segelman, M., Szydlowski, J., Kinosian, B., McNabney, M., Raziano, D.B., Eng, C., van Reenen, C., & Temkin-Greener, H. (2014, Feb). Hospitalizations in the Program of All-Inclusive Care for the elderly. *J Am Geriatr Soc*, 62(2), 320-324. doi.org/10.1111/jgs.12637.

Segelman, M., Cai, X., van Reenen, C., & Temkin-Greener, H. (2017). Transitioning from community-based to institutional long-term care: Comparing 1915(c) waiver and PACE enrollees. *Gerontologist*, 57(2), 300-308.

The Lewin Group. (2011). *2010 SNP Alliance Profile and Advanced Practice Report*. http://www.nhpg.org/media/12019/2011lewinprofilefinal.pdf.

Verdier, J., Kruse, A., Sweetland Lester, R., Philip, A.M., & Chelminsky, D. (2016). *State Contracting with Medicare Advantage Dual Eligible Special Needs Plans: Issues and Options*. Retrieved July 29 from http://www.chcs.org/media/ICRC_DSNP_Issues_Options.pdf.

Walsh, E.G., Freiman, M.P., Haber, S., Bragg, A., Ouslander, J., & Wiener, J.M. (2010). *Cost Drivers for Dually Eligible Beneficiaries: Potentially Avoidable Hospitalizations from Long-Term and Post-Acute Care Settings*.

Wieland, D., Boland, R., Baskins, J., & Kinosian, B. (2010). Five-year survival in a Program of All-inclusive Care for elderly compared with alternative institutional and home- and community-based care. *J Gerontol A Biol Sci Med Sci*, 65(7), 721-726. doi.org/10.1093/gerona/glq040.

APPENDIX A
METHODOLOGY

After describing key data sources and critical components of our analytic file construction in detail, we summarize the variables used in our analyses in ***Exhibit A-1***. Then we describe our study population and samples used for descriptive and multivariate analyses.

A.1 Data sources

The Centers for Medicare & Medicaid Services (CMS) IDR was used for all analyses. All data were accessed between January and August of 2020. Key tables, or views, are described below:

- V2_MDCR_BENE_FCT: 2015 indicators of eligibility, demographic characteristics, and institutional/HCBS outcomes:
  - Note: This table consolidates information from multiple source tables. The IDR has also been transitioning into restructured BENE_FCT_TRANS tables.
- V2_MDCR_CNTRCT_PBP_NUM: 2015 indicators of MA enrollment plan information, including specific type of integrated care plan.
- V2_MDCR_BENE_RISK_SCRE: 2014 risk adjustment data on risk scores and long term institutional status.
- V2_MDCR_BENE_RISK_PTC_F_SCRE: Hierarchical condition categories (HCCs).
- V2_MDCR_CLM: 2015 encounter data claims header information for utilization measures.
- V2_MDCR_CLM_LINE: 2015 encounter data claims line information for utilization measures.
- V2_MDCR_BENE: 2015 indicator of mortality outcome.

A.2 Analytic file construction

Full-benefit dual eligibility. Beneficiaries were considered full-benefit dual eligible if they met full-benefit criteria for all months they were enrolled in Medicare and alive in 2015. Full-benefit status was indicated by BENE_DUAL_STUS_CD = 02 (Qualified Medicare Beneficiaries plus full Medicaid), 04 (Specified Low-Income Medicare Beneficiaries plus full Medicaid), or 08 (other full-benefit duals). Beneficiaries also had to be Part A and Part B eligible for all months (BENE_PTA_STUS_CD='Y' and BENE_PTB_STUS_CD='Y').

MA plan information. Beneficiaries were considered MA enrollees for a given month if CNTRCT_PBP_PTAB_SK > 0. After restricting our sample to beneficiaries who were enrolled in MA for all months, we examined more detailed MA plan information in the table

CNTRCT_PBP_NUM. We used CNTRCT_SPCL_PLAN_IND_CD = 3 to indicate monthly enrollment in a D-SNP plan, and CNTRCT_SPCL_PLAN_IND_CD = 9 to indicate monthly enrollment in a FIDE-SNP plan. We used CNTRCT_PBP_TYPE_CD = 20 to indicate PACE enrollment. Remaining beneficiary months were considered enrollment in a regular non-integrated MA plan. We then created four mutually exclusive categories at the beneficiary-year level by excluding beneficiaries who switched between types of integrated care plans, or between integrated and non-integrated care, within the year. We then used CNTRCT_PBP_TYPE_CD = 48 (MMP HMO) or = 49 (MMP HMOPOS) to indicate MMP enrollment.

Encounter data outcomes. We identified unique beneficiary claims from 2015 using the 5-part key described in ***Exhibit A-1***.

For all claims and claim lines, we restricted observations to those marked final action (CLM_FINL_ACTN_IND='Y' and CLM_LINE_FINL_ACTN_IND='Y'). In addition, we used the institutional admission date variable CLM_ACTV_CARE_FROM_DT from inpatient claims to assess potential overlap with ED claims. We excluded ED claims where for the same beneficiary, their ED claim through date (CLM_THRU_DT) overlapped with an inpatient admission date. Thus, our measure of ED visits excluded those that resulted in an inpatient admission.

For all 2015 hospital inpatient and outpatient encounter data, we applied a 4-year runout period, through 12/31/2019 to ensure data completeness. While our study was only authorized to analyze encounters with service dates in 2015, we accessed the IDR encounter data in 2020, allowing us to use a longer runout period. For inpatient claims, we found that although the vast majority of claims were submitted within 2 years, a notable quantity were not submitted until 3 years later, even continuing into the 4th year.

We reviewed data from two types of inpatient claim codes (values indicated by CLM_TYPE_CD and description from CLM_TYPE_CD_DESC):

- 4011 = 011X Medicare Part C ENC Hospital Inpatient (Including Medicare Part A).
- 4041 = 041X Medicare Part C ENC Religious Non-medical Health Care Institutions--Hospital Inpatient.

  We did not find any claims for CLM_TYPE_CD = 4041.

  We also reviewed the following outpatient claim code types:

- 4012 = 012X Medicare Part C ENC Hospital Inpatient (Medicare Part B only).
- 4013 = 013X Medicare Part C ENC Hospital Outpatient.
- 4014 = 014X Medicare Part C ENC Hospital Laboratory Services Provided to Non-patients.
- 4085 = 085X Medicare Part C ENC Special Facility CAH Critical Access Hospital.

For ED claims, we also restricted data to ED revenue center codes, where CLM_LINE_REV_CTR_CD = 045x or 0981 (0450, 0451, 0452, 0456, 0459, 0981). Note that we checked for values of 0453, 0454, 0455, 0457, 0458 but did not find those to be populated.

Institutional/HCBS use. The monthly indicator, BENE_DUAL_INSTNL_STUS_IND_SW, categorizes beneficiary months as 1 = Institutionalized, 2 = Not institutionalized, 3 = HCBS, and 9 = Unknown. Institutional use includes Medicaid-covered stays in an NF, intermediate care facility, or inpatient psychiatric hospital for the entire span of eligibility for a given month. HCBS use includes services delivered under a Section 1115 demonstration, under a 1915(c) or (d) waiver, under a state plan amendment under 1915(i), or through enrollment in a Medicaid managed care organization with a contract under Section 1903(m) or under Section 1932 of the Social Security Act.

After examining this indicator for all months during the year, we categorized beneficiaries as having institutional use in at least 1 month (a small percentage of whom also used HCBS in at least 1 month), which constituted our institutional use outcome measure, and HCBS use in at least 1 month but no institutional use in any month, which constituted our HCBS use outcome measure.

In addition, we were able to use the monthly variables BENE_LT_INSTNL_(MONTH)_RCNCLD_IND from the risk adjustment data to identify whether a beneficiary had any long-term institutional use in 2014, which we used as a covariate indicator for prior long-term institutional use for select multivariate models. Note this is a more restricted definition of institutional use than our outcome measure, as it is focused on long-term institutional use only.

Mortality outcome. We used BENE_DEATH_DT from the V2_MDCR_BENE table to determine whether a beneficiary died in 2015. We found that several states (California, Oregon, and Utah) had death rates of less than 1% for our study population, which is far lower than expected. Thus, we excluded these states from the mortality analysis.

Original reason for entitlement code (OREC). Although V2_MDCR_BENE_FCT has an indicator for (OREC), we found this variable to have a high rate of missingness. Instead, we defined OREC using the variable BENE_MDCR_ENTLMT_RSN_CD from the IDR table V2_MDCR_BENE_MDCR_ENTLMT_RSN.

Exhibit A-1. Selected variables and data source		
IDR table	**Variable**	**Description**
Full-benefit dual eligibility (2015)		
V2_MDCR_BENE_FCT	BENE_DUAL_STUS_CD	Monthly dual status code to indicate full-benefit dual eligibility
V2_MDCR_BENE_FCT	BENE_PTA_STUS_CD	Part A eligibility
V2_MDCR_BENE_FCT	BENE_PTB_STUS_CD	Part B eligibility
MA plan information (2015)		
V2_MDCR_BENE_FCT V2_MDCR_CNTRCT_PBP_NUM	CNTRCT_PBP_PTAB_SK	MA plan enrollment
V2_MDCR_CNTRCT_PBP_NUM	CNTRCT_SPCL_PLAN_IND_CD	SNP indicator (D-SNP, FIDE-SNP)
V2_MDCR_CNTRCT_PBP_NUM	CNTRCT_PBP_TYPE_CD	Plan type indicator (PACE, MMP)
Encounter data outcomes (2015)		
V2_MDCR_CLM V2_MDCR_CLM_LINE	GEO_BENE_SK CLM_DT_SGNTR_SK CLM_TYPE_CD CLM_NUM_SK CLM_FROM_DT	5-part key to identify unique beneficiary claims
V2_MDCR_CLM V2_MDCR_CLM_LINE	CLM_FINL_ACTN_IND CLM_LINE_FINL_ACTN_IND	Final action claims header and line information
V2_MDCR_CLM V2_MDCR_CLM_LINE	CLM_TYPE_CD CLM_TYPE_CD_DESC	Indicates type of claim Used to identify inpatient and outpatient claims
V2_MDCR_CLM_LINE	CLM_LINE_REV_CTR_CD	Revenue center code
V2_MDCR_CLM_LINE	CLM_THRU_DT	Claim through date
V2_MDCR_CLM_DT_SGNTR	CLM_ACTV_CARE_FROM_DT	Date the beneficiary was admitted for an institutional claim
Mortality outcome (2015)		
V2_MDCR_BENE	BENE_DEATH_DT	Death
Institutional/HCBS outcome (2015)		
V2_MDCR_BENE_FCT	BENE_DUAL_INSTNL_STUS_IND_SW	Monthly indicator of institutional or HCBS use
Covariate used in multivariate model (2015 unless otherwise indicated)		
V2_MDCR_BENE_FCT	GEO_MDCD_FIPS_STATE_CD	State code
V2_MDCR_BENE_FCT	BENE_MDCR_STUS_CD	Current reason for Medicare entitlement
V2_MDCR_BENE_FCT	BENE_AGE_CNT	Continuous age (categorical used in multivariate model)
V2_MDCR_BENE_FCT	BENE_SEX_CD	Sex

Exhibit A-1 (*continued*)		
IDR table	**Variable**	**Description**
V2_MDCR_BENE_FCT	BENE_RACE_CD	Race
V2_MDCR_BENE_RISK_PTC_F_SCRE	BENE_PTC_HCC_X	2014 HCCs
V2_MDCR_BENE_RISK_SCRE	BENE_LT_INSTNL_(MONTH)_RCNCLD_IND	2014 long-term institutional use in any month, dichotomized to year in our analyses
V2_MDCR_BENE_ESRD_DLYS	BENE_ESRD_DLYS_TYPE_CD BENE_RNG_BGN_DT BENE_RNG_END_DT	ESRD dialysis in 2015
Included in descriptive analysis only (2015 unless otherwise indicated)		
V2_MDCR_BENE_RISK_SCRE	BENE_CMNTY_NUM	2014 community risk score
V2_MDCR_BENE_MDCR_ENTLMT_RSN	BENE_MDCR_ENTLMT_RSN_CD	Original reason for Medicare entitlement
Source: RTI analysis of MA encounter data (2015), Medicare enrollment and eligibility data (2015), and Medicare risk adjustment data (2014).		

Study population

To identify the beneficiaries in our study population, we started by selecting beneficiaries with at least 1 month of full-benefit dual eligibility in 2015 (N = 8,431,292).

We then restricted our population to beneficiaries who had Medicare Part A and B, were full-benefit dual eligible and who were consistently enrolled in a non-integrated MA plan or specific type of integrated care plan for all available months (N = 1,539,821). The vast majority of beneficiaries we excluded were not enrolled in an MA plan for all months or did not have full-benefit dual eligibility in all months. A small fraction of beneficiaries were excluded because they switched between integrated care and non-integrated care, or among integrated care plan types.

After excluding beneficiaries enrolled in a MMP, we finalized the overall study sample (N = 1,337,900) used for the descriptive analyses.

The study sample used for the multivariate analyses differed. First, since the HCCs were used as covariates for all models, the sample was restricted to beneficiaries with 2014 risk adjustment data (N = 1,196,829). Then we excluded a small number of other beneficiaries with missing covariates, leaving the final sample for the hospitalization, ED, and institutional models (N = 1,196,141). For the HCBS model, we excluded beneficiaries in PACE (N = 1,170,480). For the mortality model, we excluded beneficiaries in California, Utah, and Oregon (N = 936,833).

APPENDIX B
ADDITIONAL DESCRIPTIVE RESULTS

In ***Appendix B***, we provide additional descriptive results on various study populations. In ***Exhibit 1***, we presented the full study population for our major descriptive statistics, along with a subset of measures from the 2014 risk adjustment data. In ***Exhibit B-1***, we restricted the population to those with 2014 risk adjustment data, and present beneficiary HCCs. In ***Exhibit B-2***, we present the distribution by state for all plan types, for the full study population, and no restrictions applied. Finally, ***Exhibit B-3*** presents the smaller population used for our multivariate analyses. It is restricted to everyone with 2014 risk adjustment data, as well as no other missing covariates.

Exhibit B-1. Percentage of beneficiaries in each plan type with individual HCCs

HCC	Regular MA	D-SNP	FIDE-SNP	PACE	TOTAL
N (beneficiaries with 2014 risk scores and HCCs)	***393,402***	***687,813***	***89,949***	***25,665***	***1,196,829***
HCC1: HIV/AIDS, %	0.67	1.22	0.35	0.26	0.95
HCC2: Septicemia, Sepsis, Systemic Inflammatory Response Syndrome/Shock, %	4.22	2.13	3.21	4.55	2.95
HCC6: Opportunistic Infection, %	0.32	0.31	0.29	0.38	0.31
HCC8: Metastatic Cancer and Acute Leukemia, %	0.62	0.52	0.71	0.71	0.57
HCC9: Lung and Other Severe Cancers, %	0.94	0.78	1.16	1.13	0.87
HCC10: Lymphoma and Other Cancers, %	1.03	0.80	1.15	1.21	0.91
HCC11: Colorectal, Bladder, and Other Cancers, %	1.59	1.29	1.89	1.95	1.45
HCC12: Breast, Prostate, and Other Cancers and Tumors, %	4.15	3.71	4.81	5.43	3.97
HCC17: Diabetes with Acute Complications, %	0.68	0.58	0.63	1.13	0.63
HCC18: Diabetes with Chronic Complications, %	24.21	20.07	23.56	33.77	21.99
HCC19: Diabetes without Complication, %	15.17	15.71	16.51	12.13	15.52
HCC21: Protein-Calorie Malnutrition, %	5.04	1.95	2.95	5.91	3.13
HCC22: Morbid Obesity, %	9.58	10.36	6.99	11.66	9.88
HCC23: Other Significant Endocrine and Metabolic Disorders, %	3.91	3.25	3.86	7.10	3.60
HCC27: End-Stage Liver Disease, %	0.52	0.58	0.50	0.73	0.55
HCC28: Cirrhosis of Liver, %	0.70	0.82	0.80	0.97	0.79
HCC29: Chronic Hepatitis, %	1.08	2.05	1.08	1.30	1.64
HCC33: Intestinal Obstruction/Perforation, %	2.16	1.45	1.86	2.71	1.74
HCC34: Chronic Pancreatitis, %	0.36	0.39	0.30	0.38	0.37
HCC35: Inflammatory Bowel Disease, %	0.90	0.75	0.79	0.91	0.80
HCC39: Bone/Joint/Muscle Infections/Necrosis, %	1.55	1.08	1.15	2.07	1.26
HCC40: Rheumatoid Arthritis and Inflammatory Connective Tissue Disease, %	6.52	6.65	6.21	6.97	6.58
HCC46: Severe Hematological Disorders, %	0.55	0.44	0.50	0.56	0.48
HCC47: Disorders of Immunity, %	1.20	1.11	1.22	1.47	1.16
HCC48: Coagulation Defects and Other Specified Hematological Disorders, %	5.26	3.72	4.58	6.96	4.36
HCC54: Drug/Alcohol Psychosis, %	1.14	1.05	1.01	1.71	1.09

Exhibit B-1 (*continued*)					
HCC	**Regular MA**	**D-SNP**	**FIDE-SNP**	**PACE**	**TOTAL**
HCC55: Drug/Alcohol Dependence, %	4.28	4.82	3.24	5.51	4.53
HCC57: Schizophrenia, %	4.30	6.01	3.73	4.91	5.25
HCC58: Major Depressive, Bipolar, and Paranoid Disorders, %	18.24	15.62	17.40	27.20	16.86
HCC70: Quadriplegia, %	0.94	0.30	0.62	0.52	0.54
HCC71: Paraplegia, %	0.57	0.38	0.49	0.56	0.45
HCC72: Spinal Cord Disorders/Injuries, %	1.04	0.84	0.97	1.46	0.93
HCC73: Amyotrophic Lateral Sclerosis and Other Motor Neuron Disease, %	0.09	0.04	0.09	0.11	0.06
HCC74: Cerebral Palsy, %	0.79	1.05	0.60	0.53	0.92
HCC75: Myasthenia Gravis/Myoneural Disorders and Guillain-Barre Syndrome/Inflammatory and Toxic Neuropathy, %	1.12	0.98	0.98	1.50	1.04
HCC76: Muscular Dystrophy, %	0.12	0.12	0.10	0.11	0.12
HCC77: Multiple Sclerosis, %	1.17	0.68	0.82	1.17	0.86
HCC78: Parkinson's and Huntington's Diseases, %	3.36	1.08	2.95	5.25	2.06
HCC79: Seizure Disorders and Convulsions, %	7.05	6.33	5.40	8.73	6.55
HCC80: Coma, Brain Compression/Anoxic Damage, %	0.43	0.23	0.36	0.44	0.31
HCC82: Respirator Dependence/Tracheostomy Status, %	0.51	0.31	0.46	0.46	0.39
HCC83: Respiratory Arrest, %	0.05	0.03	0.05	0.10	0.04
HCC84: Cardio-Respiratory Failure and Shock, %	4.50	2.75	3.76	7.82	3.51
HCC85: Congestive Heart Failure, %	20.62	12.31	18.60	29.73	15.88
HCC86: Acute Myocardial Infarction, %	1.46	0.88	1.27	1.77	1.12
HCC87: Unstable Angina and Other Acute Ischemic Heart Disease, %	2.24	1.96	2.34	2.85	2.10
HCC88: Angina Pectoris, %	4.44	4.15	3.97	7.33	4.30
HCC96: Specified Heart Arrhythmias, %	15.10	7.89	15.30	21.20	11.10
HCC99: Cerebral Hemorrhage, %	0.96	0.41	0.79	1.39	0.64
HCC100: Ischemic or Unspecified Stroke, %	6.33	3.29	5.23	8.65	4.55
HCC103: Hemiplegia/Hemiparesis, %	4.83	2.43	4.30	10.73	3.54
HCC104: Monoplegia, Other Paralytic Syndromes, %	0.31	0.21	0.27	0.83	0.26
HCC106: Atherosclerosis of the Extremities with Ulceration or Gangrene, %	1.06	0.49	0.71	1.60	0.71
HCC107: Vascular Disease with Complications, %	2.63	1.83	2.72	3.95	2.20
HCC108: Vascular Disease, %	29.17	18.18	24.96	39.90	22.77
HCC110: Cystic Fibrosis, %	0.02	0.02	0.01	0.01	0.02
HCC111: Chronic Obstructive Pulmonary Disease, %	22.17	19.07	19.65	29.03	20.35
HCC112: Fibrosis of Lung and Other Chronic Lung Disorders, %	0.74	0.70	0.93	1.05	0.74
HCC114: Aspiration and Specified Bacterial Pneumonias, %	1.91	0.76	1.63	1.89	1.23
HCC115: Pneumococcal Pneumonia, Empyema, Lung Abscess, %	0.42	0.28	0.36	0.55	0.34
HCC122: Proliferative Diabetic Retinopathy and Vitreous Hemorrhage, %	1.72	1.43	1.66	2.85	1.57
HCC124: Exudative Macular Degeneration, %	1.43	0.66	1.86	2.34	1.04

Exhibit B-1 (*continued*)					
HCC	**Regular MA**	**D-SNP**	**FIDE-SNP**	**PACE**	**TOTAL**
HCC134: Dialysis Status, %	1.18	0.71	0.63	2.13	0.89
HCC135: Acute Renal Failure, %	6.66	3.70	6.34	8.32	4.97
HCC136: Chronic Kidney Disease, Stage 5, %	0.75	0.67	0.68	1.34	0.71
HCC137: Chronic Kidney Disease, Severe (Stage 4), %	1.22	0.76	1.38	3.04	1.01
HCC157: Pressure Ulcer of Skin with Necrosis Through to Muscle, Tendon, or Bone, %	0.41	0.11	0.23	0.29	0.22
HCC158: Pressure Ulcer of Skin with Full Thickness Skin Loss, %	0.87	0.20	0.50	1.16	0.46
HCC161: Chronic Ulcer of Skin, Except Pressure, %	3.82	2.16	3.58	4.99	2.87
HCC162: Severe Skin Burn or Condition, %	0.02	0.02	0.02	0.03	0.02
HCC166: Severe Head Injury, %	0.03	0.01	0.01	0.03	0.02
HCC167: Major Head Injury, %	1.10	0.71	1.02	1.62	0.88
HCC169: Vertebral Fractures without Spinal Cord Injury, %	1.96	0.91	1.99	3.14	1.38
HCC170: Hip Fracture/Dislocation, %	2.41	0.73	2.03	2.98	1.43
HCC173: Traumatic Amputations and Complications, %	0.58	0.38	0.54	0.71	0.47
HCC176: Complications of Specified Implanted Device or Graft, %	2.30	1.55	1.90	2.67	1.85
HCC186: Major Organ Transplant or Replacement Status, %	0.16	0.17	0.15	0.12	0.16
HCC188: Artificial Openings for Feeding or Elimination, %	2.11	0.91	1.82	1.95	1.40
HCC189: Amputation Status, Lower Limb/Amputation Complications, %	1.12	0.74	0.93	1.84	0.90
Source: RTI analysis of MA encounter data (2015), Medicare enrollment and eligibility data (2015), and Medicare risk adjustment data (2014).					

Exhibit B-2. Percentage of beneficiaries located in each state, by plan type					
State	**Regular MA (%)**	**D-SNP (%)**	**FIDE- SNP (%)**	**PACE (%)**	**TOTAL (%)**
N (total population)	***435,968***	***779,411***	***95,637***	***26,884***	***1,337,900***
Alaska	0.00	0.00	0.00	0.00	0.00
Alabama	0.51	1.61	0.00	0.47	1.12
Arkansas	0.88	0.74	0.00	0.50	0.73
Arizona	2.06	7.94	6.22	0.00	5.75
California	25.68	16.70	9.75	11.61	19.03
Colorado	1.74	0.77	0.00	7.79	1.17
Connecticut	1.58	0.40	0.00	0.00	0.75
District of Columbia	0.10	0.19	0.00	0.00	0.14
Delaware	0.13	0.04	0.00	0.38	0.08
Florida	8.36	9.02	0.01	2.93	8.04
Georgia	2.52	2.19	0.01	0.00	2.10
Hawaii	0.54	2.17	0.00	0.00	1.44
Iowa	0.90	0.01	0.00	0.77	0.32
Idaho	0.46	0.00	1.31	0.00	0.25
Illinois	2.23	0.80	0.01	0.00	1.19
Indiana	2.06	0.05	0.00	0.00	0.70
Kansas	0.50	0.00	0.00	0.93	0.18
Kentucky	0.57	0.24	0.00	0.00	0.32
Louisiana	0.81	1.19	0.00	0.99	0.98
Massachusetts	1.22	0.02	33.16	10.95	3.00
Maryland	0.81	0.26	0.00	0.47	0.42
Maine	0.39	0.07	0.00	0.00	0.17
Michigan	1.88	1.01	0.00	3.88	1.28
Minnesota	0.62	0.00	36.20	0.00	2.79
Missouri	2.00	1.00	0.00	0.51	1.25
Mississippi	0.21	0.57	0.00	0.00	0.40
Montana	0.08	0.00	0.00	0.00	0.03
North Carolina	2.40	1.56	0.00	3.14	1.75
North Dakota	0.06	0.00	0.00	0.31	0.03
Nebraska	0.44	0.00	0.00	0.22	0.15
New Hampshire	0.04	0.00	0.00	0.00	0.01
New Jersey	1.23	0.96	0.00	2.33	1.01
New Mexico	1.05	0.81	0.00	1.29	0.84
Nevada	0.48	0.00	0.00	0.00	0.16
New York	10.69	16.15	11.19	15.95	14.01
Ohio	2.40	0.38	0.00	0.81	1.02
Oklahoma	1.27	0.00	0.00	0.46	0.42
Oregon	2.23	2.50	0.00	3.12	2.25
Pennsylvania	5.00	11.53	0.00	15.69	8.66
Rhode Island	1.23	0.00	0.00	0.88	0.42
South Carolina	3.12	2.41	0.00	1.21	2.45
South Dakota	0.07	0.00	0.00	0.00	0.02
Tennessee	1.07	5.89	0.00	0.99	3.80
Texas	2.69	5.91	0.00	3.44	4.39
Utah	0.45	0.84	0.00	0.00	0.64
Virginia	0.95	0.07	0.00	4.01	0.43
Vermont	0.06	0.00	0.00	0.00	0.02

Exhibit B-2 (*continued*)					
State	**Regular MA (%)**	**D-SNP (%)**	**FIDE- SNP (%)**	**PACE (%)**	**TOTAL (%)**
Washington	1.98	2.25	0.00	1.66	1.99
Wisconsin	1.71	1.69	2.12	2.09	1.74
West Virginia	0.54	0.01	0.00	0.00	0.18
Wyoming	0.02	0.00	0.00	0.23	0.01
Source: RTI analysis of MA encounter data (2015), Medicare enrollment and eligibility data (2015), and Medicare risk adjustment data (2014).					

Exhibit B-3. Characteristics of study population included in multivariate regression models, by plan type					
Characteristic	**Regular MA**	**D-SNP**	**FIDE-SNP**	**PACE**	**TOTAL**
N	***393,248***	***687,315***	***89,917***	***25,661***	***1,196,141***
Outcome measures, 2015:	21.06	18.24	21.99	22.16	19.53
Any inpatient admission, %	21.06	18.24	21.99	22.16	19.53
Any ED visit, %	31.47	37.34	31.56	25.18	34.72
Institutionalized in at least 1 month, %	27.03	2.40	18.54	6.53	11.80
HCBS in at least one month but not institutionalized in any month, %	17.49	15.58	34.55	†	17.70
Died during year*, %	14.02	3.62	10.09	13.40	7.61
Age, mean (SD)	73.30 (14.93)	65.81 (15.26)	77.49 (10.81)	79.45 (9.85)	68.51 (15.27)
Age, grouped:					
<65, %	22.56	38.64	6.18	7.48	30.25
65-74, %	26.04	30.63	32.99	25.23	29.19
75-84, %	27.19	22.37	35.14	32.87	25.14
85+, %	24.20	8.35	25.68	34.41	15.43
Female, %	66.74	62.78	68.92	71.66	64.73
Race/ethnicity:					
White, non-Hispanic, %	62.11	46.19	62.30	59.76	52.93
Black, non-Hispanic, %	18.46	25.11	11.82	24.39	21.91
Hispanic, %	10.84	14.95	9.43	7.41	13.02
Asian, %	5.44	9.41	10.68	5.50	8.12
Other, %	3.15	4.34	5.77	2.94	4.02
Original reason for Medicare eligibility:					
Old age and survivors, %	62.36	47.73	74.23	68.04	54.97
Disability, %	37.19	51.84	25.64	31.37	44.62
ESRD, %	0.12	0.13	0.05	0.16	0.12
Both disability and ESRD, %	0.33	0.30	0.08	0.43	0.29
Current reason for Medicare eligibility:					
Aged without ESRD, %	76.47	60.89	93.14	90.59	69.07
Aged with ESRD, %	1.01	0.52	0.68	1.97	0.72
Disabled without ESRD, %	22.06	38.16	6.06	6.94	29.78
Disabled with ESRD, %	0.4	0.35	0.11	0.42	0.35
ESRD only, %	0.07	0.09	0.02	0.07	0.07
ESRD dialysis status for at least one month in 2015, %	1.51	0.95	0.82	2.53	1.16
N (beneficiaries with 2014 risk scores)	***393,248***	***687,315***	***89,917***	***25,661***	***1,196,141***
Community risk score, mean (SD)	1.66 (1.29)	1.25 (0.99)	1.59 (1.15)	2.15 (1.27)	1.43 (1.14)
Long-term institutional status for at least one month in 2014, %	22.80	1.21	14.95	7.67	9.48
Individual HCCs:					
HCC1: HIV/AIDS, %	0.67	1.22	0.35	0.26	0.95
HCC2: Septicemia, Sepsis, Systemic Inflammatory Response Syndrome/Shock, %	4.22	2.13	3.21	4.56	2.95
HCC6: Opportunistic Infection, %	0.32	0.31	0.29	0.38	0.31
HCC8: Metastatic Cancer and Acute Leukemia, %	0.62	0.52	0.71	0.71	0.57
HCC9: Lung and Other Severe Cancers, %	0.94	0.78	1.16	1.13	0.87

Exhibit B-3 (*continued*)					
Characteristic	**Regular MA**	**D-SNP**	**FIDE-SNP**	**PACE**	**TOTAL**
HCC10: Lymphoma and Other Cancers, %	1.03	0.80	1.15	1.21	0.91
HCC11: Colorectal, Bladder, and Other Cancers, %	1.59	1.29	1.89	1.95	1.45
HCC12: Breast, Prostate, and Other Cancers and Tumors, %	4.15	3.71	4.81	5.43	3.97
HCC17: Diabetes with Acute Complications, %	0.68	0.57	0.63	1.13	0.63
HCC18: Diabetes with Chronic Complications, %	24.22	20.08	23.57	33.77	21.99
HCC19: Diabetes without Complication, %	15.17	15.71	16.51	12.13	15.52
HCC21: Protein-Calorie Malnutrition, %	5.04	1.95	2.95	5.91	3.13
HCC22: Morbid Obesity, %	9.58	10.36	6.99	11.66	9.88
HCC23: Other Significant Endocrine and Metabolic Disorders, %	3.91	3.25	3.86	7.10	3.60
HCC27: End-Stage Liver Disease, %	0.52	0.58	0.50	0.73	0.55
HCC28: Cirrhosis of Liver, %	0.70	0.82	0.80	0.97	0.79
HCC29: Chronic Hepatitis, %	1.08	2.06	1.08	1.30	1.64
HCC33: Intestinal Obstruction/Perforation, %	2.16	1.45	1.86	2.71	1.74
HCC34: Chronic Pancreatitis, %	0.36	0.39	0.30	0.38	0.37
HCC35: Inflammatory Bowel Disease, %	0.90	0.75	0.79	0.91	0.80
HCC39: Bone/Joint/Muscle Infections/Necrosis, %	1.55	1.08	1.15	2.07	1.26
HCC40: Rheumatoid Arthritis and Inflammatory Connective Tissue Disease, %	6.52	6.65	6.21	6.97	6.58
HCC46: Severe Hematological Disorders, %	0.55	0.44	0.50	0.56	0.48
HCC47: Disorders of Immunity, %	1.20	1.11	1.22	1.47	1.16
HCC48: Coagulation Defects and Other Specified Hematological Disorders, %	5.26	3.72	4.58	6.96	4.36
HCC54: Drug/Alcohol Psychosis, %	1.14	1.05	1.01	1.71	1.09
HCC55: Drug/Alcohol Dependence, %	4.27	4.82	3.24	5.51	4.54
HCC57: Schizophrenia, %	4.30	6.01	3.73	4.90	5.25
HCC58: Major Depressive, Bipolar, and Paranoid Disorders, %	18.23	15.62	17.40	27.20	16.86
HCC70: Quadriplegia, %	0.94	0.30	0.62	0.52	0.54
HCC71: Paraplegia, %	0.56	0.38	0.49	0.56	0.45
HCC72: Spinal Cord Disorders/Injuries, %	1.04	0.84	0.97	1.46	0.93
HCC73: Amyotrophic Lateral Sclerosis and Other Motor Neuron Disease, %	0.09	0.04	0.09	0.11	0.06
HCC74: Cerebral Palsy, %	0.79	1.05	0.60	0.53	0.92

Exhibit B-3 (*continued*)					
Characteristic	**Regular MA**	**D-SNP**	**FIDE-SNP**	**PACE**	**TOTAL**
HCC75: Myasthenia Gravis/Myoneural Disorders and Guillain-Barre Syndrome/Inflammatory and Toxic Neuropathy, %	1.12	0.98	0.98	1.50	1.04
HCC76: Muscular Dystrophy, %	0.12	0.12	0.10	0.11	0.12
HCC77: Multiple Sclerosis, %	1.17	0.68	0.82	1.17	0.86
HCC78: Parkinson's and Huntington's Diseases, %	3.36	1.08	2.95	5.25	2.06
HCC79: Seizure Disorders and Convulsions, %	7.05	6.33	5.40	8.73	6.55
HCC80: Coma, Brain Compression/Anoxic Damage, %	0.43	0.23	0.36	0.44	0.31
HCC82: Respirator Dependence/Tracheostomy Status, %	0.51	0.31	0.46	0.46	0.39
HCC83: Respiratory Arrest, %	0.05	0.03	0.05	0.10	0.04
HCC84: Cardio-Respiratory Failure and Shock, %	4.50	2.75	3.76	7.83	3.51
HCC85: Congestive Heart Failure, %	20.62	12.31	18.60	29.73	15.89
HCC86: Acute Myocardial Infarction, %	1.46	0.88	1.27	1.77	1.12
HCC87: Unstable Angina and Other Acute Ischemic Heart Disease, %	2.24	1.96	2.34	2.85	2.10
HCC88: Angina Pectoris, %	4.44	4.15	3.97	7.33	4.30
HCC96: Specified Heart Arrhythmias, %	15.10	7.89	15.30	21.20	11.10
HCC99: Cerebral Hemorrhage, %	0.96	0.41	0.79	1.40	0.64
HCC100: Ischemic or Unspecified Stroke, %	6.33	3.29	5.23	8.65	4.55
HCC103: Hemiplegia/Hemiparesis, %	4.83	2.43	4.30	10.74	3.54
HCC104: Monoplegia, Other Paralytic Syndromes, %	0.31	0.21	0.27	0.83	0.26
HCC106: Atherosclerosis of the Extremities with Ulceration or Gangrene, %	1.06	0.49	0.71	1.60	0.71
HCC107: Vascular Disease with Complications, %	2.63	1.83	2.71	3.95	2.20
HCC108: Vascular Disease, %	29.18	18.19	24.97	39.90	22.78
HCC110: Cystic Fibrosis, %	0.02	0.02	0.01	0.01	0.02
HCC111: Chronic Obstructive Pulmonary Disease, %	22.17	19.08	19.65	29.03	20.35
HCC112: Fibrosis of Lung and Other Chronic Lung Disorders, %	0.74	0.70	0.93	1.05	0.74
HCC114: Aspiration and Specified Bacterial Pneumonias, %	1.91	0.76	1.63	1.89	1.23
HCC115: Pneumococcal Pneumonia, Empyema, Lung Abscess, %	0.42	0.28	0.36	0.55	0.34
HCC122: Proliferative Diabetic Retinopathy and Vitreous Hemorrhage, %	1.72	1.43	1.65	2.85	1.57

Exhibit B-3 (*continued*)					
Characteristic	**Regular MA**	**D-SNP**	**FIDE-SNP**	**PACE**	**TOTAL**
HCC124: Exudative Macular Degeneration, %	1.43	0.66	1.86	2.34	1.04
HCC134: Dialysis Status, %	1.18	0.71	0.63	2.13	0.89
HCC135: Acute Renal Failure, %	6.67	3.70	6.34	8.32	4.98
HCC136: Chronic Kidney Disease, Stage 5, %	0.75	0.67	0.68	1.34	0.71
HCC137: Chronic Kidney Disease, Severe (Stage 4), %	1.22	0.76	1.37	3.04	1.01
HCC157: Pressure Ulcer of Skin with Necrosis Through to Muscle, Tendon, or Bone, %	0.41	0.11	0.23	0.29	0.22
HCC158: Pressure Ulcer of Skin with Full Thickness Skin Loss, %	0.87	0.20	0.50	1.16	0.46
HCC161: Chronic Ulcer of Skin, Except Pressure, %	3.82	2.16	3.58	4.99	2.87
HCC162: Severe Skin Burn or Condition, %	0.02	0.02	0.02	0.03	0.02
HCC166: Severe Head Injury, %	0.03	0.01	0.01	0.03	0.02
HCC167: Major Head Injury, %	1.10	0.71	1.02	1.63	0.88
HCC169: Vertebral Fractures without Spinal Cord Injury, %	1.96	0.91	1.99	3.13	1.38
HCC170: Hip Fracture/Dislocation, %	2.41	0.73	2.03	2.98	1.43
HCC173: Traumatic Amputations and Complications, %	0.58	0.38	0.54	0.71	0.47
HCC176: Complications of Specified Implanted Device or Graft, %	2.30	1.55	1.90	2.67	1.85
HCC186: Major Organ Transplant or Replacement Status, %	0.16	0.17	0.15	0.12	0.16
HCC188: Artificial Openings for Feeding or Elimination, %	2.11	0.91	1.82	1.95	1.40
HCC189: Amputation Status, Lower Limb/Amputation Complications, %	1.12	0.74	0.93	1.84	0.90
Count of HCCs, mean (SD)	2.87 (2.64)	2.16 (2.16)	2.60 (2.44)	3.84 (2.72)	2.46 (2.39)

* Mortality rate excludes beneficiaries from California, Oregon, and Utah.

† Percentage of beneficiaries in PACE with any HCBS is not reported because HCBS delivered by PACE are not under the various Medicaid waiver programs.

Source: RTI analysis of MA encounter data (2015), Medicare enrollment and eligibility data (2015), and Medicare risk adjustment data (2014).

APPENDIX C
FULL REGRESSION MODEL RESULTS

Exhibit C-1. Full logistic regression model results predicting any inpatient hospitalization in 2015

Parameter	Odds Ratio	95% Confidence Interval	
Plan type (reference = regular MA)			
D-SNP	0.970 ***	0.958	0.981
FIDE-SNP	1.241 ***	1.207	1.277
PACE	0.689 ***	0.667	0.713
Age group (reference = 65-74)			
< 65	0.996	0.981	1.012
75-84	1.258 ***	1.241	1.275
85+	1.506 ***	1.481	1.531
Male	0.997	0.987	1.008
Race (reference = White)			
Black	1.000	0.987	1.013
Hispanic	0.806 ***	0.793	0.820
Asian	0.627 ***	0.613	0.642
Other race/ethnicity	0.808 ***	0.786	0.830
Long-term institutional use in 2014	0.499 ***	0.490	0.509
Proportion of months with data available in 2015	0.292 ***	0.283	0.300
ESRD patient with dialysis status	5.188 ***	4.904	5.490
HCC 1: HIV/AIDS	1.239 ***	1.182	1.299
HCC 2: Septicemia, Sepsis, Systemic Inflammatory Response Syndrome/Shock	1.179 ***	1.148	1.211
HCC 6: Opportunistic Infections	1.385 ***	1.288	1.490
HCC 8: Metastatic Cancer and Acute Leukemia	1.444 ***	1.367	1.525
HCC 9: Lung and Other Severe Cancers	1.395 ***	1.334	1.458
HCC 10: Lymphoma and Other Cancers	1.269 ***	1.213	1.328
HCC 11: Colorectal, Bladder, and Other Cancers	1.176 ***	1.134	1.220
HCC 12: Breast, Prostate, and Other Cancers and Tumors	1.034 **	1.010	1.058
HCC 17: Diabetes with Acute Complications	1.805 ***	1.714	1.900
HCC 18: Diabetes with Chronic Complications	1.333 ***	1.316	1.349
HCC 19: Diabetes without Complication	1.215 ***	1.199	1.232
HCC 21: Protein-Calorie Malnutrition	0.935 ***	0.911	0.960
HCC 22: Morbid Obesity	1.220 ***	1.202	1.240
HCC 23: Other Significant Endocrine and Metabolic Disorders	1.119 ***	1.093	1.146
HCC 27: End-Stage Liver Disease	1.608 ***	1.521	1.700
HCC 28: Cirrhosis of Liver	1.369 ***	1.305	1.435
HCC 29: Chronic Hepatitis	1.190 ***	1.148	1.234
HCC 33: Intestinal Obstruction/Perforation	1.249 ***	1.209	1.291
HCC 34: Chronic Pancreatitis	1.753 ***	1.643	1.872
HCC 35: Inflammatory Bowel Disease	1.327 ***	1.265	1.391
HCC 39: Bone/Joint/Muscle Infections/Necrosis	1.304 ***	1.254	1.356
HCC 40: Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	1.166 ***	1.145	1.187
HCC 46: Severe Hematological Disorders	1.577 ***	1.487	1.673

Exhibit C-1 (*continued*)			
Parameter	**Odds Ratio**	**95% Confidence Interval**	
HCC 47: Disorders of Immunity	1.204 ***	1.156	1.253
HCC 48: Coagulation Defects and Other Specified Hematological Disorders	1.128 ***	1.104	1.152
HCC 54: Drug/Alcohol Psychosis	1.925 ***	1.851	2.001
HCC 55: Drug/Alcohol Dependence	1.386 ***	1.357	1.416
HCC 57: Schizophrenia	1.452 ***	1.422	1.483
HCC 58: Major Depressive, Bipolar, and Paranoid Disorders	1.124 ***	1.109	1.139
HCC 70: Quadriplegia	1.183 ***	1.112	1.259
HCC 71: Paraplegia	1.499 ***	1.407	1.598
HCC 72: Spinal Cord Disorders/Injuries	1.155 ***	1.103	1.209
HCC 73: Amyotrophic Lateral Sclerosis and Other Motor Neuron Disease	1.375 ***	1.159	1.631
HCC 74: Cerebral Palsy	0.948	0.899	1.001
HCC 75: Myasthenia Gravis/Myoneural Disorders and Guillain-Barre Syndrome/Inflammatory and Toxic Neuropathy	1.075 ***	1.030	1.122
HCC 76: Muscular Dystrophy	1.105	0.966	1.263
HCC 77: Multiple Sclerosis	1.463 ***	1.395	1.534
HCC 78: Parkinson's and Huntington's Diseases	1.239 ***	1.201	1.278
HCC 79: Seizure Disorders and Convulsions	1.265 ***	1.242	1.288
HCC 80: Coma, Brain Compression/Anoxic Damage	0.953	0.881	1.031
HCC 82: Respirator Dependence/Tracheostomy Status	1.225 ***	1.145	1.310
HCC 83: Respiratory Arrest	1.251 *	1.026	1.526
HCC 84: Cardio-Respiratory Failure and Shock	1.364 ***	1.332	1.397
HCC 85: Congestive Heart Failure	1.350 ***	1.332	1.368
HCC 86: Acute Myocardial Infarction	1.242 ***	1.194	1.292
HCC 87: Unstable Angina and Other Acute Ischemic Heart Disease	1.323 ***	1.285	1.362
HCC 88: Angina Pectoris	1.120 ***	1.096	1.145
HCC 96: Specified Heart Arrhythmias	1.282 ***	1.263	1.301
HCC 99: Cerebral Hemorrhage	1.078 *	1.017	1.142
HCC 100: Ischemic or Unspecified Stroke	1.237 ***	1.210	1.264
HCC 103: Hemiplegia/Hemiparesis	1.121 ***	1.092	1.150
HCC 104: Monoplegia, Other Paralytic Syndromes	1.216 ***	1.118	1.323
HCC 106: Atherosclerosis of the Extremities with Ulceration or Gangrene	1.402 ***	1.333	1.476
HCC 107: Vascular Disease with Complications	1.247 ***	1.211	1.284
HCC 108: Vascular Disease	1.078 ***	1.065	1.091
HCC 110: Cystic Fibrosis	2.886 ***	2.196	3.793
HCC 111: Chronic Obstructive Pulmonary Disease	1.491 ***	1.474	1.508
HCC 112: Fibrosis of Lung and Other Chronic Lung Disorders	1.291 ***	1.227	1.359
HCC 114: Aspiration and Specified Bacterial Pneumonias	0.983	0.945	1.023
HCC 115: Pneumococcal Pneumonia, Empyema, Lung Abscess	1.114 **	1.038	1.195
HCC 122: Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	1.178 ***	1.137	1.220
HCC 124: Exudative Macular Degeneration	1.063 **	1.017	1.111
HCC 134: Dialysis Status	0.635 ***	0.595	0.678
HCC 135: Acute Renal Failure	1.349 ***	1.321	1.377
HCC 136: Chronic Kidney Disease, Stage 5	1.070 *	1.016	1.128
HCC 137: Chronic Kidney Disease, Severe (Stage 4)	1.311 ***	1.257	1.367
HCC 157: Pressure Ulcer of Skin with Necrosis Through to Muscle, Tendon, or Bone	1.336 ***	1.221	1.461

Exhibit C-1 (*continued*)			
Parameter	**Odds Ratio**	**95% Confidence Interval**	
HCC 158: Pressure Ulcer of Skin with Full Thickness Skin Loss	1.074 *	1.009	1.143
HCC 161: Chronic Ulcer of Skin, Except Pressure	1.279 ***	1.247	1.312
HCC 162: Severe Skin Burn or Condition	0.900	0.671	1.208
HCC 166: Severe Head Injury	0.823	0.596	1.138
HCC 167: Major Head Injury	1.102 ***	1.049	1.158
HCC 169: Vertebral Fractures without Spinal Cord Injury	1.246 ***	1.201	1.293
HCC 170: Hip Fracture/Dislocation	1.032	0.995	1.071
HCC 173: Traumatic Amputations and Complications	1.049	0.986	1.117
HCC 176: Complications of Specified Implanted Device or Graft	1.300 ***	1.259	1.342
HCC 186: Major Organ Transplant or Replacement Status	1.467 ***	1.325	1.624
HCC 188: Artificial Openings for Feeding or Elimination	1.362 ***	1.312	1.413
HCC 189: Amputation Status, Lower Limb/Amputation Complications	1.312 ***	1.255	1.372
State (reference = California)			
Alaska	2.036	0.636	6.519
Alabama	1.776 ***	1.698	1.858
Arkansas	2.180 ***	2.072	2.293
Arizona	1.572 ***	1.533	1.611
Colorado	1.378 ***	1.317	1.443
Connecticut	1.851 ***	1.757	1.951
District of Columbia	1.495 ***	1.316	1.698
Delaware	1.447 ***	1.224	1.709
Florida	1.477 ***	1.445	1.510
Georgia	1.599 ***	1.545	1.655
Hawaii	1.785 ***	1.708	1.865
Iowa	1.999 ***	1.852	2.158
Idaho	1.183 ***	1.073	1.304
Illinois	2.124 ***	2.036	2.216
Indiana	2.050 ***	1.945	2.161
Kansas	2.304 ***	2.093	2.537
Kentucky	2.545 ***	2.363	2.742
Louisiana	1.810 ***	1.724	1.901
Massachusetts	1.344 ***	1.296	1.394
Maryland	1.148 ***	1.063	1.240
Maine	1.286 ***	1.142	1.447
Michigan	1.707 ***	1.636	1.782
Minnesota	1.278 ***	1.229	1.329
Missouri	1.892 ***	1.817	1.970
Mississippi	2.039 ***	1.902	2.185
Montana	1.213	0.899	1.638
North Carolina	1.600 ***	1.541	1.660
North Dakota	0.359 ***	0.232	0.555
Nebraska	1.979 ***	1.771	2.213
New Hampshire	2.854 ***	2.028	4.016
New Jersey	1.586 ***	1.511	1.665
New Mexico	1.582 ***	1.498	1.671
Nevada	1.587 ***	1.419	1.776
New York	1.711 ***	1.679	1.744
Ohio	2.064 ***	1.975	2.156
Oklahoma	2.204 ***	2.063	2.354

Exhibit C-1 (*continued*)			
Parameter	**Odds Ratio**	**95% Confidence Interval**	
Oregon	1.458 ***	1.407	1.511
Pennsylvania	1.857 ***	1.818	1.897
Rhode Island	1.562 ***	1.457	1.675
South Carolina	1.611 ***	1.559	1.664
South Dakota	0.520 **	0.348	0.777
Tennessee	1.852 ***	1.801	1.904
Texas	1.621 ***	1.579	1.664
Utah	1.602 ***	1.507	1.703
Virginia	1.898 ***	1.776	2.029
Vermont	1.415	0.997	2.010
Washington	1.605 ***	1.549	1.662
Wisconsin	1.681 ***	1.620	1.744
West Virginia	2.356 ***	2.139	2.596
Wyoming	2.168 ***	1.445	3.253

*/**/*** = Significantly different from regular MA plan based on a p-value cutoff of 0.05/0.01/0.001

NOTES: The model also included an interaction term between an indicator for a beneficiary who originally became eligible for Medicare because of disability and another indicator for being aged 65 or older in 2015. This interaction term is not shown in the table because the OR for an interaction term is not directly interpretable.

SOURCE: RTI analysis of MA encounter data (2015), Medicare enrollment and eligibility data (2015), and Medicare risk adjustment data (2014).

Exhibit C-2. Full logistic regression model results predicting any ED visit			
Parameter	**Odds Ratio**	**95% Confidence Interval**	
Plan type (reference = regular MA)			
D-SNP	1.160 ***	1.149	1.172
FIDE-SNP	1.141 ***	1.113	1.170
PACE	0.523 ***	0.507	0.539
Age group (reference = 65-74)			
< 65	1.572 ***	1.553	1.591
75-84	1.078 ***	1.065	1.090
85+	1.198 ***	1.181	1.215
Male	0.820 ***	0.813	0.828
Race (reference = White)			
Black	1.149 ***	1.137	1.161
Hispanic	0.899 ***	0.888	0.911
Asian	0.522 ***	0.512	0.532
Other race/ethnicity	0.763 ***	0.746	0.780
Long-term institutional use in 2014	0.377 ***	0.370	0.384
Proportion of months with data available in 2015	2.323 ***	2.247	2.401
ESRD patient with dialysis status	2.377 ***	2.255	2.506
HCC 1: HIV/AIDS	1.179 ***	1.133	1.226
HCC 2: Septicemia, Sepsis, Systemic Inflammatory Response Syndrome/Shock	1.094 ***	1.066	1.123
HCC 6: Opportunistic Infections	1.171 ***	1.093	1.255
HCC 8: Metastatic Cancer and Acute Leukemia	1.235 ***	1.173	1.300
HCC 9: Lung and Other Severe Cancers	1.149 ***	1.102	1.199
HCC 10: Lymphoma and Other Cancers	1.143 ***	1.098	1.191
HCC 11: Colorectal, Bladder, and Other Cancers	1.078 ***	1.043	1.114
HCC 12: Breast, Prostate, and Other Cancers and Tumors	1.099 ***	1.077	1.121
HCC 17: Diabetes with Acute Complications	1.527 ***	1.453	1.604
HCC 18: Diabetes with Chronic Complications	1.254 ***	1.241	1.267
HCC 19: Diabetes without Complication	1.175 ***	1.162	1.188
HCC 21: Protein-Calorie Malnutrition	0.904 ***	0.881	0.926
HCC 22: Morbid Obesity	1.167 ***	1.151	1.182
HCC 23: Other Significant Endocrine and Metabolic Disorders	1.096 ***	1.072	1.119
HCC 27: End-Stage Liver Disease	1.212 ***	1.150	1.278
HCC 28: Cirrhosis of Liver	1.222 ***	1.170	1.276
HCC 29: Chronic Hepatitis	1.219 ***	1.183	1.257
HCC 33: Intestinal Obstruction/Perforation	1.229 ***	1.192	1.267
HCC 34: Chronic Pancreatitis	1.612 ***	1.512	1.718
HCC 35: Inflammatory Bowel Disease	1.263 ***	1.210	1.319
HCC 39: Bone/Joint/Muscle Infections/Necrosis	1.086 ***	1.047	1.127
HCC 40: Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	1.216 ***	1.197	1.235
HCC 46: Severe Hematological Disorders	1.255 ***	1.186	1.327
HCC 47: Disorders of Immunity	1.054 **	1.016	1.094
HCC 48: Coagulation Defects and Other Specified Hematological Disorders	1.119 ***	1.097	1.141
HCC 54: Drug/Alcohol Psychosis	1.793 ***	1.727	1.861
HCC 55: Drug/Alcohol Dependence	1.356 ***	1.331	1.382
HCC 57: Schizophrenia	1.160 ***	1.139	1.180
HCC 58: Major Depressive, Bipolar, and Paranoid Disorders	1.258 ***	1.244	1.272
HCC 70: Quadriplegia	0.883 ***	0.833	0.936

Exhibit C-2 (*continued*)			
Parameter	**Odds Ratio**	**95% Confidence Interval**	
HCC 71: Paraplegia	1.034	0.975	1.097
HCC 72: Spinal Cord Disorders/Injuries	1.174 ***	1.127	1.222
HCC 73: Amyotrophic Lateral Sclerosis and Other Motor Neuron Disease	1.057	0.897	1.245
HCC 74: Cerebral Palsy	0.814 ***	0.781	0.849
HCC 75: Myasthenia Gravis/Myoneural Disorders and Guillain-Barre Syndrome/Inflammatory and Toxic Neuropathy	1.079 ***	1.039	1.121
HCC 76: Muscular Dystrophy	0.996	0.891	1.114
HCC 77: Multiple Sclerosis	1.071 **	1.027	1.118
HCC 78: Parkinson's and Huntington's Diseases	1.241 ***	1.206	1.277
HCC 79: Seizure Disorders and Convulsions	1.317 ***	1.296	1.338
HCC 80: Coma, Brain Compression/Anoxic Damage	0.951	0.885	1.022
HCC 82: Respirator Dependence/Tracheostomy Status	0.942	0.883	1.005
HCC 83: Respiratory Arrest	1.009	0.833	1.223
HCC 84: Cardio-Respiratory Failure and Shock	1.061 ***	1.037	1.086
HCC 85: Congestive Heart Failure	1.119 ***	1.105	1.133
HCC 86: Acute Myocardial Infarction	1.231 ***	1.186	1.278
HCC 87: Unstable Angina and Other Acute Ischemic Heart Disease	1.468 ***	1.428	1.508
HCC 88: Angina Pectoris	1.219 ***	1.195	1.243
HCC 96: Specified Heart Arrhythmias	1.222 ***	1.205	1.239
HCC 99: Cerebral Hemorrhage	1.097 ***	1.041	1.157
HCC 100: Ischemic or Unspecified Stroke	1.198 ***	1.173	1.222
HCC 103: Hemiplegia/Hemiparesis	0.994	0.971	1.018
HCC 104: Monoplegia, Other Paralytic Syndromes	0.987	0.914	1.065
HCC 106: Atherosclerosis of the Extremities with Ulceration or Gangrene	1.012	0.963	1.064
HCC 107: Vascular Disease with Complications	1.184 ***	1.152	1.217
HCC 108: Vascular Disease	1.031 ***	1.021	1.042
HCC 110: Cystic Fibrosis	1.198	0.920	1.559
HCC 111: Chronic Obstructive Pulmonary Disease	1.322 ***	1.308	1.336
HCC 112: Fibrosis of Lung and Other Chronic Lung Disorders	1.232 ***	1.178	1.289
HCC 114: Aspiration and Specified Bacterial Pneumonias	0.940 **	0.904	0.977
HCC 115: Pneumococcal Pneumonia, Empyema, Lung Abscess	1.034	0.966	1.105
HCC 122: Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	1.056 ***	1.023	1.090
HCC 124: Exudative Macular Degeneration	1.113 ***	1.070	1.158
HCC 134: Dialysis Status	0.901 ***	0.848	0.957
HCC 135: Acute Renal Failure	1.152 ***	1.130	1.175
HCC 136: Chronic Kidney Disease, Stage 5	0.920 ***	0.877	0.966
HCC 137: Chronic Kidney Disease, Severe (Stage 4)	1.028	0.988	1.070
HCC 157: Pressure Ulcer of Skin with Necrosis Through to Muscle, Tendon, or Bone	0.955	0.873	1.044
HCC 158: Pressure Ulcer of Skin with Full Thickness Skin Loss	0.908 **	0.853	0.966
HCC 161: Chronic Ulcer of Skin, Except Pressure	1.105 ***	1.079	1.132
HCC 162: Severe Skin Burn or Condition	0.921	0.710	1.196
HCC 166: Severe Head Injury	1.144	0.867	1.508
HCC 167: Major Head Injury	1.241 ***	1.189	1.297
HCC 169: Vertebral Fractures without Spinal Cord Injury	1.234 ***	1.193	1.277
HCC 170: Hip Fracture/Dislocation	1.043 *	1.007	1.079
HCC 173: Traumatic Amputations and Complications	1.043	0.983	1.106

Exhibit C-2 (*continued*)			
Parameter	**Odds Ratio**	**95% Confidence Interval**	
HCC 176: Complications of Specified Implanted Device or Graft	1.306 ***	1.268	1.346
HCC 186: Major Organ Transplant or Replacement Status	1.071	0.974	1.178
HCC 188: Artificial Openings for Feeding or Elimination	1.315 ***	1.269	1.362
HCC 189: Amputation Status, Lower Limb/Amputation Complications	1.023	0.981	1.067
State (ref = California)			
Alaska	1.952	0.715	5.330
Alabama	1.499 ***	1.445	1.555
Arkansas	1.797 ***	1.720	1.878
Arizona	1.314 ***	1.289	1.340
Colorado	1.437 ***	1.384	1.491
Connecticut	1.794 ***	1.714	1.877
District of Columbia	1.217 ***	1.098	1.349
Delaware	1.168 *	1.008	1.354
Florida	0.998	0.980	1.015
Georgia	1.622 ***	1.577	1.668
Hawaii	1.434 ***	1.383	1.486
Iowa	1.957 ***	1.830	2.093
Idaho	1.693 ***	1.569	1.826
Illinois	1.484 ***	1.430	1.539
Indiana	1.800 ***	1.719	1.886
Kansas	1.616 ***	1.478	1.767
Kentucky	2.032 ***	1.900	2.174
Louisiana	1.813 ***	1.743	1.886
Massachusetts	1.416 ***	1.373	1.460
Maryland	0.975	0.913	1.041
Maine	2.026 ***	1.849	2.220
Michigan	1.533 ***	1.479	1.589
Minnesota	1.113 ***	1.076	1.152
Missouri	1.634 ***	1.579	1.692
Mississippi	1.761 ***	1.661	1.866
Montana	1.033	0.803	1.329
North Carolina	1.543 ***	1.496	1.591
North Dakota	0.435 ***	0.304	0.624
Nebraska	1.700 ***	1.544	1.873
New Hampshire	1.618 **	1.141	2.294
New Jersey	1.302 ***	1.251	1.355
New Mexico	1.369 ***	1.310	1.430
Nevada	1.124 *	1.017	1.242
New York	1.077 ***	1.060	1.093
Ohio	1.882 ***	1.811	1.955
Oklahoma	1.801 ***	1.699	1.909
Oregon	1.279 ***	1.244	1.315
Pennsylvania	1.480 ***	1.455	1.505
Rhode Island	1.493 ***	1.404	1.587
South Carolina	1.814 ***	1.768	1.862
South Dakota	0.581 **	0.415	0.813
Tennessee	1.650 ***	1.614	1.688
Texas	1.314 ***	1.287	1.342
Utah	1.204 ***	1.148	1.263

Exhibit C-2 (*continued*)			
Parameter	**Odds Ratio**	**95% Confidence Interval**	
Virginia	1.700 ***	1.603	1.803
Vermont	1.620 ***	1.220	2.150
Washington	1.416 ***	1.376	1.457
Wisconsin	1.596 ***	1.548	1.646
West Virginia	2.233 ***	2.044	2.440
Wyoming	1.973 ***	1.370	2.840

*/**/*** = Significantly different from regular MA plan based on a p-value cutoff of 0.05/0.01/0.001

NOTES: The model also included an interaction term between an indicator for a beneficiary who originally became eligible for Medicare because of disability and another indicator for being aged 65 or older in 2015. This interaction term is not shown in the table because the OR for an interaction term is not directly interpretable.

SOURCE: RTI analysis of MA encounter data (2015), Medicare enrollment and eligibility data (2015), and Medicare risk adjustment data (2014).

Exhibit C-3. Full logistic regression model results predicting any institutional use			
Parameter	**Odds Ratio**	**95% Confidence Interval**	
Plan type (reference = regular MA)			
D-SNP	0.127 ***	0.124	0.129
FIDE-SNP	0.320 ***	0.308	0.332
PACE	0.062 ***	0.058	0.065
Age group (reference = 65-74)			
< 65	0.348 ***	0.337	0.359
75-84	2.344 ***	2.294	2.395
85+	6.392 ***	6.245	6.542
Male	1.101 ***	1.083	1.120
Race/ethnicity (reference = White)			
Black	0.477 ***	0.467	0.488
Hispanic	0.237 ***	0.228	0.246
Asian	0.307 ***	0.295	0.320
Other race/ethnicity	0.407 ***	0.388	0.427
Proportion of months with data available in 2015	0.306 ***	0.295	0.317
ESRD patient with dialysis status	1.872 ***	1.719	2.039
HCC 1: HIV/AIDS	0.921	0.811	1.047
HCC 2: Septicemia, Sepsis, Systemic Inflammatory Response Syndrome/Shock	1.317 ***	1.269	1.366
HCC 6: Opportunistic Infections	0.781 ***	0.689	0.885
HCC 8: Metastatic Cancer and Acute Leukemia	0.860 ***	0.789	0.938
HCC 9: Lung and Other Severe Cancers	0.796 ***	0.742	0.855
HCC 10: Lymphoma and Other Cancers	0.859 ***	0.802	0.921
HCC 11: Colorectal, Bladder, and Other Cancers	0.717 ***	0.678	0.758
HCC 12: Breast, Prostate, and Other Cancers and Tumors	0.800 ***	0.772	0.829
HCC 17: Diabetes with Acute Complications	1.394 ***	1.285	1.512
HCC 18: Diabetes with Chronic Complications	0.976 *	0.958	0.995
HCC 19: Diabetes without Complication	0.969 **	0.949	0.990
HCC 21: Protein-Calorie Malnutrition	1.900 ***	1.840	1.962
HCC 22: Morbid Obesity	0.989	0.962	1.017
HCC 23: Other Significant Endocrine and Metabolic Disorders	0.861 ***	0.830	0.894
HCC 27: End-Stage Liver Disease	1.270 ***	1.156	1.396
HCC 28: Cirrhosis of Liver	1.069	0.981	1.164
HCC 29: Chronic Hepatitis	0.836 ***	0.768	0.911
HCC 33: Intestinal Obstruction/Perforation	0.938 **	0.894	0.983
HCC 34: Chronic Pancreatitis	0.798 ***	0.705	0.903
HCC 35: Inflammatory Bowel Disease	0.807 ***	0.746	0.872
HCC 39: Bone/Joint/Muscle Infections/Necrosis	1.130 ***	1.066	1.197
HCC 40: Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.787 ***	0.764	0.812
HCC 46: Severe Hematological Disorders	1.004	0.915	1.101
HCC 47: Disorders of Immunity	0.893 **	0.836	0.955
HCC 48: Coagulation Defects and Other Specified Hematological Disorders	1.036 *	1.004	1.069
HCC 54: Drug/Alcohol Psychosis	1.405 ***	1.321	1.495
HCC 55: Drug/Alcohol Dependence	0.810 ***	0.777	0.845
HCC 57: Schizophrenia	3.335 ***	3.221	3.454
HCC 58: Major Depressive, Bipolar, and Paranoid Disorders	1.893 ***	1.856	1.930
HCC 70: Quadriplegia	3.773 ***	3.493	4.076
HCC 71: Paraplegia	2.034 ***	1.864	2.220

Exhibit C-3 (*continued*)			
Parameter	**Odds Ratio**	**95% Confidence Interval**	
HCC 72: Spinal Cord Disorders/Injuries	1.257 ***	1.176	1.344
HCC 73: Amyotrophic Lateral Sclerosis and Other Motor Neuron Disease	1.663 ***	1.342	2.060
HCC 74: Cerebral Palsy	2.003 ***	1.858	2.159
HCC 75: Myasthenia Gravis/Myoneural Disorders and Guillain-Barre Syndrome/Inflammatory and Toxic Neuropathy	0.954	0.892	1.019
HCC 76: Muscular Dystrophy	1.520 ***	1.241	1.863
HCC 77: Multiple Sclerosis	2.822 ***	2.650	3.006
HCC 78: Parkinson's and Huntington's Diseases	2.419 ***	2.334	2.506
HCC 79: Seizure Disorders and Convulsions	1.762 ***	1.714	1.811
HCC 80: Coma, Brain Compression/Anoxic Damage	1.477 ***	1.334	1.634
HCC 82: Respirator Dependence/Tracheostomy Status	1.143 **	1.039	1.257
HCC 83: Respiratory Arrest	0.699 *	0.524	0.934
HCC 84: Cardio-Respiratory Failure and Shock	1.035	0.999	1.072
HCC 85: Congestive Heart Failure	1.175 ***	1.152	1.198
HCC 86: Acute Myocardial Infarction	0.799 ***	0.755	0.844
HCC 87: Unstable Angina and Other Acute Ischemic Heart Disease	0.709 ***	0.676	0.743
HCC 88: Angina Pectoris	0.636 ***	0.613	0.659
HCC 96: Specified Heart Arrhythmias	1.092 ***	1.070	1.114
HCC 99: Cerebral Hemorrhage	1.400 ***	1.302	1.506
HCC 100: Ischemic or Unspecified Stroke	1.560 ***	1.516	1.606
HCC 103: Hemiplegia/Hemiparesis	1.979 ***	1.916	2.045
HCC 104: Monoplegia, Other Paralytic Syndromes	1.526 ***	1.358	1.715
HCC 106: Atherosclerosis of the Extremities with Ulceration or Gangrene	2.490 ***	2.328	2.663
HCC 107: Vascular Disease with Complications	1.473 ***	1.412	1.536
HCC 108: Vascular Disease	2.063 ***	2.030	2.098
HCC 110: Cystic Fibrosis	0.841	0.444	1.593
HCC 111: Chronic Obstructive Pulmonary Disease	0.859 ***	0.844	0.875
HCC 112: Fibrosis of Lung and Other Chronic Lung Disorders	0.798 ***	0.733	0.868
HCC 114: Aspiration and Specified Bacterial Pneumonias	1.402 ***	1.332	1.475
HCC 115: Pneumococcal Pneumonia, Empyema, Lung Abscess	1.045	0.941	1.160
HCC 122: Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	0.950	0.896	1.007
HCC 124: Exudative Macular Degeneration	0.844 ***	0.800	0.890
HCC 134: Dialysis Status	0.670 ***	0.605	0.742
HCC 135: Acute Renal Failure	1.137 ***	1.105	1.170
HCC 136: Chronic Kidney Disease, Stage 5	1.090 *	1.006	1.182
HCC 137: Chronic Kidney Disease, Severe (Stage 4)	1.007	0.948	1.068
HCC 157: Pressure Ulcer of Skin with Necrosis Through to Muscle, Tendon, or Bone	2.134 ***	1.913	2.381
HCC 158: Pressure Ulcer of Skin with Full Thickness Skin Loss	2.214 ***	2.057	2.384
HCC 161: Chronic Ulcer of Skin, Except Pressure	1.422 ***	1.374	1.472
HCC 162: Severe Skin Burn or Condition	1.076	0.698	1.659
HCC 166: Severe Head Injury	2.026 ***	1.368	3.000
HCC 167: Major Head Injury	1.400 ***	1.310	1.496
HCC 169: Vertebral Fractures without Spinal Cord Injury	1.198 ***	1.143	1.256
HCC 170: Hip Fracture/Dislocation	1.803 ***	1.729	1.881
HCC 173: Traumatic Amputations and Complications	0.994	0.910	1.086

Exhibit C-3 (*continued*)			
Parameter	**Odds Ratio**	**95% Confidence Interval**	
HCC 176: Complications of Specified Implanted Device or Graft	0.905 ***	0.863	0.950
HCC 186: Major Organ Transplant or Replacement Status	0.749 **	0.603	0.931
HCC 188: Artificial Openings for Feeding or Elimination	1.684 ***	1.605	1.768
HCC 189: Amputation Status, Lower Limb/Amputation Complications	1.301 ***	1.221	1.386
State (reference = California)			
Alaska	1.162	0.111	12.129
Alabama	4.234 ***	3.897	4.600
Arkansas	2.680 ***	2.468	2.909
Arizona	2.001 ***	1.912	2.094
Colorado	5.078 ***	4.803	5.368
Connecticut	5.281 ***	4.959	5.623
District of Columbia	1.218	0.918	1.617
Delaware	15.447 ***	12.611	18.920
Florida	0.583 ***	0.557	0.611
Georgia	4.131 ***	3.927	4.345
Hawaii	4.071 ***	3.772	4.393
Iowa	2.446 ***	2.232	2.680
Idaho	1.882 ***	1.675	2.114
Illinois	5.030 ***	4.761	5.314
Indiana	3.861 ***	3.633	4.103
Kansas	4.451 ***	3.990	4.965
Kentucky	7.303 ***	6.636	8.038
Louisiana	6.156 ***	5.718	6.628
Massachusetts	3.122 ***	2.974	3.277
Maryland	17.185 ***	15.776	18.720
Maine	2.113 ***	1.856	2.406
Michigan	4.230 ***	3.991	4.482
Minnesota	5.689 ***	5.419	5.973
Missouri	2.397 ***	2.256	2.548
Mississippi	2.112 ***	1.809	2.467
Montana	4.450 ***	3.439	5.759
North Carolina	3.647 ***	3.460	3.844
North Dakota	8.471 ***	6.495	11.048
Nebraska	2.087 ***	1.812	2.404
New Hampshire	8.369 ***	5.679	12.332
New Jersey	2.918 ***	2.718	3.133
New Mexico	1.766 ***	1.613	1.934
Nevada	0.695 ***	0.594	0.814
New York	3.307 ***	3.208	3.409
Ohio	5.355 ***	5.091	5.634
Oklahoma	1.577 ***	1.442	1.725
Oregon	1.298 ***	1.222	1.379
Pennsylvania	4.494 ***	4.342	4.650
Rhode Island	4.019 ***	3.741	4.318
South Carolina	1.114 **	1.043	1.191
South Dakota	8.594 ***	6.580	11.225
Tennessee	2.281 ***	2.153	2.417
Texas	2.861 ***	2.738	2.991

Exhibit C-3 (*continued*)			
Parameter	**Odds Ratio**	**95% Confidence Interval**	
Utah	1.753 ***	1.551	1.982
Virginia	2.081 ***	1.903	2.274
Vermont	2.491 ***	1.742	3.564
Washington	2.287 ***	2.169	2.412
Wisconsin	4.281 ***	4.067	4.505
West Virginia	5.599 ***	5.057	6.199
Wyoming	2.074 *	1.180	3.644

*/**/*** = Significantly different from regular MA plan based on a p-value cutoff of 0.05/0.01/0.001

NOTES: The model also included an interaction term between an indicator for a beneficiary who originally became eligible for Medicare because of disability and another indicator for being aged 65 or older in 2015. This interaction term is not shown in the table because the OR for an interaction term is not directly interpretable.

SOURCE: RTI analysis of MA encounter data (2015), Medicare enrollment and eligibility data (2015), and Medicare risk adjustment data (2014).

Exhibit C-4. Full logistic regression model results predicting any HCBS use			
Parameter	**Odds Ratio**	**95% Confidence Interval**	
Plan type (reference = regular MA)			
D-SNP	1.046 ***	1.033	1.060
FIDE-SNP	4.223 ***	4.102	4.347
Age group (reference = 65-74)			
< 65	1.651 ***	1.623	1.679
75-84	1.681 ***	1.655	1.707
85+	2.380 ***	2.337	2.424
Male	0.956 ***	0.945	0.967
Race/ethnicity (reference = White)			
Black	1.152 ***	1.136	1.169
Hispanic	0.802 ***	0.787	0.818
Asian	1.177 ***	1.150	1.205
Other race/ethnicity	1.048 **	1.019	1.077
Proportion of months with data available in 2015	1.376 ***	1.329	1.425
ESRD patient with dialysis status	1.254 ***	1.178	1.335
HCC 1: HIV/AIDS	1.434 ***	1.363	1.507
HCC 2: Septicemia, Sepsis, Systemic Inflammatory Response Syndrome/Shock	0.966 *	0.937	0.997
HCC 6: Opportunistic Infections	1.236 ***	1.138	1.342
HCC 8: Metastatic Cancer and Acute Leukemia	1.416 ***	1.332	1.505
HCC 9: Lung and Other Severe Cancers	1.314 ***	1.249	1.381
HCC 10: Lymphoma and Other Cancers	1.130 ***	1.074	1.189
HCC 11: Colorectal, Bladder, and Other Cancers	1.107 ***	1.062	1.153
HCC 12: Breast, Prostate, and Other Cancers and Tumors	1.061 ***	1.034	1.088
HCC 17: Diabetes with Acute Complications	1.076 *	1.011	1.145
HCC 18: Diabetes with Chronic Complications	1.264 ***	1.246	1.281
HCC 19: Diabetes without Complication	1.060 ***	1.044	1.075
HCC 21: Protein-Calorie Malnutrition	0.823 ***	0.799	0.849
HCC 22: Morbid Obesity	1.253 ***	1.232	1.275
HCC 23: Other Significant Endocrine and Metabolic Disorders	1.157 ***	1.126	1.188
HCC 27: End-Stage Liver Disease	1.078 *	1.008	1.154
HCC 28: Cirrhosis of Liver	0.994	0.937	1.054
HCC 29: Chronic Hepatitis	0.811 ***	0.775	0.848
HCC 33: Intestinal Obstruction/Perforation	1.082 ***	1.042	1.123
HCC 34: Chronic Pancreatitis	1.017	0.937	1.104
HCC 35: Inflammatory Bowel Disease	0.980	0.927	1.036
HCC 39: Bone/Joint/Muscle Infections/Necrosis	1.036	0.990	1.083
HCC 40: Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	1.149 ***	1.126	1.172
HCC 46: Severe Hematological Disorders	1.009	0.941	1.081
HCC 47: Disorders of Immunity	1.140 ***	1.089	1.194
HCC 48: Coagulation Defects and Other Specified Hematological Disorders	1.050 ***	1.025	1.077
HCC 54: Drug/Alcohol Psychosis	0.784 ***	0.746	0.825
HCC 55: Drug/Alcohol Dependence	0.812 ***	0.790	0.835
HCC 57: Schizophrenia	0.771 ***	0.752	0.790
HCC 58: Major Depressive, Bipolar, and Paranoid Disorders	0.903 ***	0.890	0.916
HCC 70: Quadriplegia	1.663 ***	1.565	1.766
HCC 71: Paraplegia	2.767 ***	2.594	2.950
HCC 72: Spinal Cord Disorders/Injuries	1.720 ***	1.642	1.801

Exhibit C-4 (*continued*)			
Parameter	**Odds Ratio**	**95% Confidence Interval**	
HCC 73: Amyotrophic Lateral Sclerosis and Other Motor Neuron Disease	2.047 ***	1.720	2.435
HCC 74: Cerebral Palsy	6.629 ***	6.345	6.926
HCC 75: Myasthenia Gravis/Myoneural Disorders and Guillain-Barre Syndrome/Inflammatory and Toxic Neuropathy	1.184 ***	1.130	1.240
HCC 76: Muscular Dystrophy	2.558 ***	2.265	2.890
HCC 77: Multiple Sclerosis	1.736 ***	1.656	1.820
HCC 78: Parkinson's and Huntington's Diseases	1.378 ***	1.334	1.424
HCC 79: Seizure Disorders and Convulsions	1.726 ***	1.694	1.759
HCC 80: Coma, Brain Compression/Anoxic Damage	1.025	0.944	1.114
HCC 82: Respirator Dependence/Tracheostomy Status	1.261 ***	1.171	1.359
HCC 83: Respiratory Arrest	1.584 ***	1.273	1.970
HCC 84: Cardio-Respiratory Failure and Shock	1.227 ***	1.194	1.262
HCC 85: Congestive Heart Failure	1.212 ***	1.193	1.231
HCC 86: Acute Myocardial Infarction	0.989	0.944	1.035
HCC 87: Unstable Angina and Other Acute Ischemic Heart Disease	1.111 ***	1.074	1.149
HCC 88: Angina Pectoris	1.122 ***	1.094	1.151
HCC 96: Specified Heart Arrhythmias	1.022 *	1.005	1.039
HCC 99: Cerebral Hemorrhage	0.921 **	0.865	0.980
HCC 100: Ischemic or Unspecified Stroke	1.189 ***	1.161	1.217
HCC 103: Hemiplegia/Hemiparesis	1.586 ***	1.544	1.629
HCC 104: Monoplegia, Other Paralytic Syndromes	1.513 ***	1.384	1.653
HCC 106: Atherosclerosis of the Extremities with Ulceration or Gangrene	1.149 ***	1.085	1.217
HCC 107: Vascular Disease with Complications	1.084 ***	1.049	1.120
HCC 108: Vascular Disease	0.917 ***	0.905	0.929
HCC 110: Cystic Fibrosis	0.928	0.647	1.333
HCC 111: Chronic Obstructive Pulmonary Disease	1.088 ***	1.074	1.103
HCC 112: Fibrosis of Lung and Other Chronic Lung Disorders	1.121 ***	1.059	1.187
HCC 114: Aspiration and Specified Bacterial Pneumonias	0.825 ***	0.789	0.863
HCC 115: Pneumococcal Pneumonia, Empyema, Lung Abscess	0.959	0.883	1.042
HCC 122: Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	1.226 ***	1.178	1.276
HCC 124: Exudative Macular Degeneration	1.189 ***	1.135	1.245
HCC 134: Dialysis Status	1.112 **	1.034	1.197
HCC 135: Acute Renal Failure	1.162 ***	1.135	1.189
HCC 136: Chronic Kidney Disease, Stage 5	1.034	0.974	1.099
HCC 137: Chronic Kidney Disease, Severe (Stage 4)	1.219 ***	1.162	1.280
HCC 157: Pressure Ulcer of Skin with Necrosis Through to Muscle, Tendon, or Bone	0.838 ***	0.759	0.926
HCC 158: Pressure Ulcer of Skin with Full Thickness Skin Loss	0.795 ***	0.741	0.852
HCC 161: Chronic Ulcer of Skin, Except Pressure	1.213 ***	1.179	1.247
HCC 162: Severe Skin Burn or Condition	1.217	0.894	1.658
HCC 166: Severe Head Injury	1.044	0.751	1.451
HCC 167: Major Head Injury	1.273 ***	1.210	1.340
HCC 169: Vertebral Fractures without Spinal Cord Injury	1.172 ***	1.124	1.222
HCC 170: Hip Fracture/Dislocation	1.030	0.990	1.072
HCC 173: Traumatic Amputations and Complications	1.205 ***	1.126	1.290
HCC 176: Complications of Specified Implanted Device or Graft	1.165 ***	1.124	1.207

Exhibit C-4 (*continued*)			
Parameter	**Odds Ratio**	**95% Confidence Interval**	
HCC 186: Major Organ Transplant or Replacement Status	0.879 *	0.777	0.995
HCC 188: Artificial Openings for Feeding or Elimination	1.036	0.994	1.080
HCC 189: Amputation Status, Lower Limb/Amputation Complications	1.480 ***	1.410	1.554
State (reference = California)			
Alaska	3.558	0.806	15.711
Alabama	2.427 ***	2.281	2.582
Arkansas	3.558 ***	3.331	3.801
Arizona	4.791 ***	4.646	4.942
Colorado	14.125 ***	13.518	14.760
Connecticut	7.450 ***	7.057	7.865
District of Columbia	5.813 ***	5.128	6.591
Delaware	2.157 ***	1.723	2.700
Florida	4.164 ***	4.040	4.292
Georgia	5.490 ***	5.279	5.710
Hawaii	4.011 ***	3.815	4.216
Iowa	11.442 ***	10.617	12.331
Idaho	11.165 ***	10.288	12.115
Illinois	10.119 ***	9.685	10.572
Indiana	4.481 ***	4.206	4.775
Kansas	11.458 ***	10.398	12.627
Kentucky	2.721 ***	2.446	3.028
Louisiana	2.390 ***	2.232	2.559
Massachusetts	0.813 ***	0.775	0.852
Maryland	1.764 ***	1.594	1.953
Maine	1.169	0.946	1.445
Michigan	1.816 ***	1.696	1.943
Minnesota	6.175 ***	5.938	6.422
Missouri	6.542 ***	6.249	6.848
Mississippi	11.409 ***	10.685	12.182
Montana	6.568 ***	5.029	8.577
North Carolina	1.036	0.965	1.112
North Dakota	1.084	0.618	1.903
Nebraska	3.372 ***	2.911	3.907
New Hampshire	6.682 ***	4.599	9.709
New Jersey	1.558 ***	1.437	1.690
New Mexico	21.736 ***	20.721	22.801
Nevada	9.443 ***	8.501	10.488
New York	7.893 ***	7.694	8.097
Ohio	13.881 ***	13.288	14.499
Oklahoma	9.431 ***	8.810	10.094
Oregon	23.493 ***	22.710	24.304
Pennsylvania	6.287 ***	6.113	6.466
Rhode Island	3.781 ***	3.484	4.103
South Carolina	4.780 ***	4.598	4.970
South Dakota	5.689 ***	4.283	7.558
Tennessee	2.766 ***	2.660	2.876
Texas	4.034 ***	3.898	4.175
Utah	5.655 ***	5.304	6.029
Virginia	11.369 ***	10.601	12.192

Exhibit C-4 (*continued*)			
Parameter	**Odds Ratio**	**95% Confidence Interval**	
Vermont	7.628 ***	5.461	10.654
Washington	13.084 ***	12.628	13.557
Wisconsin	10.317 ***	9.930	10.718
West Virginia	5.679 ***	5.101	6.323
Wyoming	15.508 ***	9.536	25.222

*/**/*** = Significantly different from regular MA plan based on a p-value cutoff of 0.05/0.01/0.001

NOTES: The model also included an interaction term between an indicator for a beneficiary who originally became eligible for Medicare because of disability and another indicator for being aged 65 or older in 2015. This interaction term is not shown in the table because the OR for an interaction term is not directly interpretable. The model excluded beneficiaries in PACE.

SOURCE: RTI analysis of MA encounter data (2015), Medicare enrollment and eligibility data (2015), and Medicare risk adjustment data (2014).

Exhibit C-5. Full logistic model results predicting mortality			
Parameter	**Odds Ratio**	**95% Confidence Interval**	
Plan type (reference = regular MA)			
D-SNP	0.578 ***	0.565	0.591
FIDE-SNP	0.694 ***	0.663	0.728
PACE	0.958	0.917	1.002
Age group (reference = 65-74)			
< 65	0.526 ***	0.509	0.545
75-84	1.652 ***	1.611	1.694
85+	3.298 ***	3.210	3.389
Male	1.354 ***	1.329	1.379
Race/ethnicity (reference = White)			
Black	0.757 ***	0.740	0.775
Hispanic	0.530 ***	0.510	0.551
Asian	0.449 ***	0.425	0.473
Other race/ethnicity	0.623 ***	0.589	0.659
Long-term institutional use in 2014	2.310 ***	2.258	2.362
ESRD patient with dialysis status	2.336 ***	2.156	2.532
HCC 1: HIV/AIDS	1.241 ***	1.113	1.385
HCC 2: Septicemia, Sepsis, Systemic Inflammatory Response Syndrome/Shock	0.946 **	0.909	0.983
HCC 6: Opportunistic Infections	1.117	0.993	1.256
HCC 8: Metastatic Cancer and Acute Leukemia	4.539 ***	4.245	4.853
HCC 9: Lung and Other Severe Cancers	2.287 ***	2.154	2.427
HCC 10: Lymphoma and Other Cancers	1.353 ***	1.260	1.453
HCC 11: Colorectal, Bladder, and Other Cancers	1.324 ***	1.253	1.399
HCC 12: Breast, Prostate, and Other Cancers and Tumors	1.026	0.987	1.067
HCC 17: Diabetes with Acute Complications	1.221 ***	1.118	1.332
HCC 18: Diabetes with Chronic Complications	1.045 ***	1.023	1.068
HCC 19: Diabetes without Complication	0.997	0.974	1.022
HCC 21: Protein-Calorie Malnutrition	1.360 ***	1.315	1.406
HCC 22: Morbid Obesity	0.859 ***	0.832	0.887
HCC 23: Other Significant Endocrine and Metabolic Disorders	1.049 *	1.009	1.091
HCC 27: End-Stage Liver Disease	2.397 ***	2.208	2.603
HCC 28: Cirrhosis of Liver	1.716 ***	1.587	1.856
HCC 29: Chronic Hepatitis	1.295 ***	1.197	1.401
HCC 33: Intestinal Obstruction/Perforation	0.915 ***	0.870	0.963
HCC 34: Chronic Pancreatitis	1.404 ***	1.256	1.569
HCC 35: Inflammatory Bowel Disease	0.929	0.853	1.012
HCC 39: Bone/Joint/Muscle Infections/Necrosis	0.984	0.923	1.048
HCC 40: Rheumatoid Arthritis and Inflammatory Connective Tissue Disease	0.986	0.954	1.019
HCC 46: Severe Hematological Disorders	1.235 ***	1.129	1.351
HCC 47: Disorders of Immunity	1.418 ***	1.334	1.508
HCC 48: Coagulation Defects and Other Specified Hematological Disorders	1.070 ***	1.035	1.106
HCC 54: Drug/Alcohol Psychosis	1.079 *	1.005	1.159
HCC 55: Drug/Alcohol Dependence	1.107 ***	1.058	1.158
HCC 57: Schizophrenia	0.854 ***	0.815	0.895
HCC 58: Major Depressive, Bipolar, and Paranoid Disorders	0.912 ***	0.891	0.933
HCC 70: Quadriplegia	1.474 ***	1.363	1.595
HCC 71: Paraplegia	1.026	0.914	1.151

Exhibit C-5 (*continued*)			
Parameter	**Odds Ratio**	**95% Confidence Interval**	
HCC 72: Spinal Cord Disorders/Injuries	1.007	0.930	1.091
HCC 73: Amyotrophic Lateral Sclerosis and Other Motor Neuron Disease	2.074 ***	1.656	2.598
HCC 74: Cerebral Palsy	0.772 ***	0.681	0.875
HCC 75: Myasthenia Gravis/Myoneural Disorders and Guillain-Barre Syndrome/Inflammatory and Toxic Neuropathy	1.004	0.934	1.078
HCC 76: Muscular Dystrophy	1.395 **	1.103	1.765
HCC 77: Multiple Sclerosis	1.069	0.977	1.169
HCC 78: Parkinson's and Huntington's Diseases	1.428 ***	1.373	1.485
HCC 79: Seizure Disorders and Convulsions	1.057 ***	1.024	1.092
HCC 80: Coma, Brain Compression/Anoxic Damage	0.893	0.793	1.006
HCC 82: Respirator Dependence/Tracheostomy Status	1.221 ***	1.106	1.349
HCC 83: Respiratory Arrest	1.114	0.832	1.493
HCC 84: Cardio-Respiratory Failure and Shock	1.427 ***	1.379	1.477
HCC 85: Congestive Heart Failure	1.353 ***	1.326	1.382
HCC 86: Acute Myocardial Infarction	1.128 ***	1.067	1.192
HCC 87: Unstable Angina and Other Acute Ischemic Heart Disease	0.977	0.930	1.026
HCC 88: Angina Pectoris	0.918 ***	0.883	0.954
HCC 96: Specified Heart Arrhythmias	1.253 ***	1.227	1.280
HCC 99: Cerebral Hemorrhage	1.007	0.928	1.093
HCC 100: Ischemic or Unspecified Stroke	1.107 ***	1.072	1.143
HCC 103: Hemiplegia/Hemiparesis	1.069 ***	1.028	1.110
HCC 104: Monoplegia, Other Paralytic Syndromes	1.027	0.895	1.179
HCC 106: Atherosclerosis of the Extremities with Ulceration or Gangrene	1.403 ***	1.307	1.505
HCC 107: Vascular Disease with Complications	1.045	0.998	1.094
HCC 108: Vascular Disease	1.113 ***	1.092	1.135
HCC 110: Cystic Fibrosis	1.789 *	1.047	3.059
HCC 111: Chronic Obstructive Pulmonary Disease	1.375 ***	1.349	1.403
HCC 112: Fibrosis of Lung and Other Chronic Lung Disorders	1.256 ***	1.153	1.370
HCC 114: Aspiration and Specified Bacterial Pneumonias	1.128 ***	1.073	1.186
HCC 115: Pneumococcal Pneumonia, Empyema, Lung Abscess	1.276 ***	1.153	1.412
HCC 122: Proliferative Diabetic Retinopathy and Vitreous Hemorrhage	1.097 **	1.029	1.169
HCC 124: Exudative Macular Degeneration	0.954	0.899	1.013
HCC 134: Dialysis Status	1.193 ***	1.083	1.314
HCC 135: Acute Renal Failure	1.257 ***	1.220	1.295
HCC 136: Chronic Kidney Disease, Stage 5	1.359 ***	1.254	1.474
HCC 137: Chronic Kidney Disease, Severe (Stage 4)	1.610 ***	1.518	1.707
HCC 157: Pressure Ulcer of Skin with Necrosis Through to Muscle, Tendon, or Bone	1.356 ***	1.213	1.516
HCC 158: Pressure Ulcer of Skin with Full Thickness Skin Loss	1.218 ***	1.132	1.311
HCC 161: Chronic Ulcer of Skin, Except Pressure	1.285 ***	1.238	1.334
HCC 162: Severe Skin Burn or Condition	0.958	0.594	1.544
HCC 166: Severe Head Injury	0.806	0.495	1.313
HCC 167: Major Head Injury	0.990	0.916	1.071
HCC 169: Vertebral Fractures without Spinal Cord Injury	1.095 ***	1.038	1.154
HCC 170: Hip Fracture/Dislocation	0.989	0.944	1.036
HCC 173: Traumatic Amputations and Complications	1.135 **	1.036	1.244

Exhibit C-5 (*continued*)			
Parameter	**Odds Ratio**	**95% Confidence Interval**	
HCC 176: Complications of Specified Implanted Device or Graft	0.905 ***	0.859	0.953
HCC 186: Major Organ Transplant or Replacement Status	0.967	0.804	1.162
HCC 188: Artificial Openings for Feeding or Elimination	1.196 ***	1.136	1.260
HCC 189: Amputation Status, Lower Limb/Amputation Complications	1.379 ***	1.289	1.474
State (reference = New York)			
Alaska	1.072	0.126	9.133
Alabama	1.098 *	1.005	1.201
Arkansas	1.482 ***	1.365	1.610
Arizona	1.028	0.983	1.075
Colorado	1.317 ***	1.242	1.397
Connecticut	0.916 *	0.854	0.983
District of Columbia	1.245 *	1.005	1.542
Delaware	0.949	0.776	1.160
Florida	0.812 ***	0.781	0.845
Georgia	1.211 ***	1.147	1.279
Hawaii	1.468 ***	1.359	1.586
Iowa	0.984	0.877	1.103
Idaho	1.560 ***	1.375	1.769
Illinois	1.134 ***	1.063	1.210
Indiana	1.254 ***	1.166	1.349
Kansas	1.417 ***	1.251	1.606
Kentucky	1.494 ***	1.345	1.660
Louisiana	1.342 ***	1.238	1.455
Massachusetts	1.044	0.990	1.100
Maryland	1.158 ***	1.064	1.260
Maine	1.523 ***	1.326	1.749
Michigan	1.540 ***	1.452	1.634
Minnesota	1.543 ***	1.460	1.630
Missouri	1.236 ***	1.158	1.319
Mississippi	1.451 ***	1.277	1.650
Montana	1.450 *	1.059	1.984
North Carolina	1.392 ***	1.319	1.468
North Dakota	1.203	0.911	1.590
Nebraska	1.007	0.845	1.199
New Hampshire	1.808 **	1.252	2.611
New Jersey	0.894 **	0.827	0.965
New Mexico	1.253 ***	1.149	1.366
Nevada	1.123	0.961	1.312
Ohio	0.191 ***	0.172	0.211
Oklahoma	1.163 **	1.052	1.286
Pennsylvania	1.200 ***	1.161	1.241
Rhode Island	0.864 ***	0.796	0.938
South Carolina	1.160 ***	1.095	1.228
South Dakota	1.506 **	1.146	1.980
Tennessee	1.506 ***	1.435	1.580
Texas	1.396 ***	1.339	1.456
Virginia	1.504 ***	1.377	1.642
Vermont	1.192	0.757	1.876

Exhibit C-5 (*continued*)			
Parameter	**Odds Ratio**	**95% Confidence Interval**	
Washington	1.405 ***	1.334	1.481
Wisconsin	0.894 ***	0.843	0.948
West Virginia	1.476 ***	1.315	1.657
Wyoming	1.987 **	1.235	3.198

*/**/*** = Significantly different from regular MA plan based on a p-value cutoff of 0.05/0.01/0.001

NOTES: The model also included an interaction term between an indicator for a beneficiary who originally became eligible for Medicare because of disability and another indicator for being aged 65 or older in 2015. This interaction term is not shown in the table because the OR for an interaction term is not directly interpretable. The model excluded beneficiaries in California, Oregon, and Utah.

SOURCE: RTI analysis of MA encounter data (2015), Medicare enrollment and eligibility data (2015), and Medicare risk adjustment data (2014).