Massachusetts Senior Care Option 2005-2010 Impact on Enrollees: Nursing Home Entry Utilization
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JEN Associates, Inc.
5 Bigelow Street
Cambridge, MA 02139
Phone: (617) 868-5578 • Fax: (617) 868-7963

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EXECUTIVE SUMMARY

Senior Care Options (SCO) is an integrated Medicare-Medicaid managed care program offered to elderly dually eligible Massachusetts residents since 2004. MassHealth and the federal Centers for Medicare & Medicaid Services (CMS) contract with qualified managed care plans to provide SCO enrollees with a unified benefits package that includes the full range of Medicaid and Medicare services plus additional, program determined, care support.

The present SCO evaluation focused on patterns of nursing facility (NF) entry subsequent to SCO enrollment. The study population consisted of community-dwelling Massachusetts residents enrolling in a SCO plan between 2004-2009 and a matched control cohort covered by the traditional, separate fee-for-service (FFS) Medicaid and Medicare programs. A propensity-matched case/control cohort study design balanced many inter-cohort differences.

All annual cohorts were followed through the end of calendar year 2010. Follow-up was censored on the basis of death, loss of Medicare FFS eligibility, or loss of SCO enrollment status. The model directly addressed censoring due to the variable follow-up times experienced by cases and controls. Nursing facility residency was identified through the Nursing Home Minimum Data Set (MDS) assessment records filed with CMS. These records are equally available for the SCO and FFS control populations. A multivariate proportional hazards model adjusted for additional confounding factors before yielding the independent association between SCO enrollment and risk of NF entry.

The analysis broke down nursing facility residency into three categories: long-stay (≥4 months) , end-of-life stay (≤4 months terminating with the patient's death), and short-stay (<4 months terminating with the patient's return to community living):

- **Long-Stay NF Entry:** The proportional hazards estimate showed that SCO enrollment confers a 16% overall reduction in long-stay NF entry risk. The descriptive time profile revealed that beneficiaries needed at least 18 months in SCO before exhibiting an observable long-stay risk reduction.

- **End-of-Life NF Entry:** The proportional hazards estimate showed that SCO enrollment confers a 23% reduction in end-of-life NF entry risk. The descriptive time profile revealed that beneficiaries needed at least 6 months in SCO before exhibiting an observable end-of-life stay risk reduction.

- **Short-Stay NF Entry:** Both the proportional hazards model and the descriptive time profile showed no SCO effect on short stay NF entries.

- **Mortality:** SCO enrollment furthermore was associated with a 17% reduction in the risk of death in the follow-up period. This benefit was not observable until after at least six months of SCO enrollment.

Aside from SCO enrollment, the pre-index presence of certain chronic diseases and use of community-based or short-term nursing facility services had strong, independent correlations with future outcomes among SCO enrollees and their matched controls. High scores in the JEN frailty index (a morbidity measure using pre-enrollment period diagnoses) were associated with a 53%-86% increase in the risk of NF entry.

SCO enrollees exhibit reduced nursing facility entry and mortality compared to non-enrollees, possibly due to the care improvements brought about by integrating Medicare and Medicaid services and adding special service types based on enrollee need. The lack of service utilization data after SCO enrollment obscures the mechanism driving these benefits, however. Medicare's new Encounter Data System (EDS) will provide abundant new utilization data for its managed care beneficiaries. Besides helping to explain the nursing home and mortality reductions found in the present

evaluation, EDS records will provide further information on SCO's overall advantages as related to specific patterns of services.

INTRODUCTION

The MassHealth Office of Long Term Care has contracted with JEN Associates, to provide analytical and statistical consulting support for the MassHealth Senior Care Options (SCO) program. JEN linked the administrative data for Medicare and Medicaid and then developed and provided critical descriptive and financial information needed to structure and implement the SCO model.

SCO is an integrated Medicare and Medicaid managed care program available to elderly Medicaid-eligible beneficiaries since 2004. Massachusetts Medicaid and the federal Centers for Medicare & Medicaid Services (CMS) jointly contract with qualified managed care plans to provide a complete benefit package that includes the full range of Medicaid and Medicare services for enrollees of all disability levels.

The SCO program's goal is to take advantage of Medicare-Medicaid integration to enhance coordination of acute and long-term care. A Medicaid capitation structure that is responsive to changing levels of frailty make SCO plans especially well-suited for providing flexible and extended community care to enrollees. The standard Medicare capitation rate based on the previous year's diagnoses is used for Medicare services.

It is hypothesized that the impact of the SCO model is based on the dynamic nature of the Medicaid capitation rate and the requirement to perform regular assessments. This financing feature differentiates SCOs from other capitated programs. There is a financial incentive to recognize a high-risk case and to manage both the Medicaid and Medicare benefits to reduce adverse events. One of the most costly events to Medicaid is long-term entry into a nursing facility (NF). By increasing access to community long-term care in a timely way, it is hypothesized that SCO will reduce NF rates.

COHORT SELECTION

To assess SCO's actual impact on nursing facility entry, JEN identified annual cohorts of SCO enrollees matched control cohorts for the 2004-2009 period and followed them through 2010. SCO enrollees included in the study were community-dwelling Massachusetts residents with dual Medicaid/Medicare eligibility and no Medicare managed care participation during the three months prior to their SCO enrollment month. Follow-up could be truncated by death, loss of Medicare FFS eligibility, or either SCO discontinuation (cases) or enrollment (controls). The year-month of SCO enrollment, as observed in the Medicaid eligibility data, served as the index month.

The analytic challenge was to identify an equivalent non-SCO control population so that unbiased comparisons could be made with the SCO enrollees. The control selection specification aimed for 3 controls to be selected for each case. Controls were assigned the same index month as their cases and required to have dual Medicaid/Medicare eligibility without Medicare managed care participation during the three months prior to the index month.

A two stage matching process was employed to select annual matched control cohorts. The first stage involved the direct matching of cases and controls on key characteristics. The second stage involved propensity matching to further adjust for the remaining differences in population characteristics. All direct matching variables were used in combination with additional propensity characteristics to create a multivariate model of an individual's propensity for SCO entry (see table below). A patient's propensity score is simply the probability of becoming a SCO enrollee based on the propensity model covariates present in that individual.

The propensity score is used within the population selected through direct matching to isolate a SCO-like control cohort. When a SCO enrollee did not have a non-SCO match

with the same propensity score, the closest match was sought by looking within the same decile of the propensity score distribution to locate the nearest neighbor match.

Control Selection Factors

Study Member Characteristic	Match Type
Gender Male Female	Direct Match
Index Age Categories Age <65 Age 65-74 Age 75-84 Age 85+	Direct Match
Race/Ethnicity White Black Hispanic Other/Unknown Race	Direct Match
County	Direct Match
SCO Enrollment Month (as determined by cases)	Direct Match
Medicare Status in Index Month Part A Only Part B Only Parts A & B Part A Only/State Paid Premium Part B Only/State Paid Premium Parts A & B/State Paid Premium	Direct Match
MA Risk Status Month prior to Index Community/Other Community Long-Term Care Nursing/Institutional Long-Term Care	Direct Match
Medicaid NF Case Mix Status Month prior to Index	Direct Match
Alzheimer's/Chronic Mental Illness Indication in Month prior to Index	Direct Match
Base Period (1-3 months pre-index) Medical Utilization Acute Inpatient Utilization Home Health Utilization Adult Foster Care Day Habilitation Utilization Medicaid Waiver Program Utilization	Propensity
Base Period (1-3 months pre-index) Long-Term Support Service Status Hierarchy 1) Long Stay Nursing Home 2) Post-Acute Care Skilled Nursing Facility 3) Community	Propensity

Study Member Characteristic	Match Type
FFS Dual Eligible in July-December of Year Prior to Index	Direct
Prior Year JEN Frailty Score[1] 0 1-3 4-6 7+	Propensity
Prior Year Chronic Disease Indicators Diabetes Ischemic Heart Disease Cerebral Vascular Disease Chronic Respiratory Disease Arthritis Congestive Heart Failure	Propensity

Data Sources

The baseline data for both the case and comparison populations was derived from Medicare and Medicaid administrative data. The data included program enrollment records with beneficiary demographics and health services claims data with detailed information on pre-index patterns of procedures, diagnoses and episodes of acute hospital and long term care utilization. In the post-index period, health services claims data is no longer available for the SCO enrollees since the SCO plans are paid on a monthly capitated basis without regard to the particular health services rendered. The SCO monthly enrollment records do include information on both nursing facility status and need for community long term care services. Complete health services utilization data for the entire observation period is available for a non-SCO comparison population under the separate Medicare and Medicaid fee-for-service programs.

Implementing a fair comparison between outcomes in the SCO enrollees and the matched control cohort requires a data source that provides equal information for the

[1] The JEN Frailty Score is a predictive index for future need for long terms supportive services. The score is based on diagnoses observed in a pre-period. There is an approximately linear relationship between the score and observed nursing facility utilization is test populations. Score values range from 0-13 and can be grouped as 0, 1-3, 4-6 and 7+.

complete study population. CMS's national Nursing Home Minimum Data Set (MDS) contains records of all stays in certified nursing facilities. The records include dates of stay, morbidity flags, activity of daily living assessments and other supporting data. In summary, the pre-enrollment period for study cases and controls can be profiled in depth using Medicaid and Medicare claims and enrollment data and the post enrollment period can be analyzed using SCO and Medicaid/Medicare enrollment data along with the national MDS source.

Outcome Analysis

There are three major types of nursing facility episodes: 1) short-term rehabilitation; 2) short-term end-of-life care; 3) long-term placement in an institution. The first modality frequently follows an acute care hospitalization. The second type depends on the availability and quality of end-of-life community care. Long-term NF placement is the most costly to the Medicaid program and perhaps the most difficult to reduce since it is attributable in many cases to an extended history of functional decline. The different modalities of NF entry were the main outcome measures of interest. A fourth endpoint, death, was also evaluated in this study since it is the ultimate outcome of most nursing home stays.

An NF episode required a stay of four or more months to qualify as a long-stay outcome; death within four months of initiation defined an end-of-life stay; and episodes of less than four months with discharge to the community were classified as short-stay. The probability of discharge back to the community is very low past the four-month mark. An episode algorithm based on the observed frequency and timing of MDS assessment records was created to model length of stay in a nursing facility.

A multivariate Cox proportional hazard model measured the probability of nursing facility entry or death after adjusting for pre-index utilization and select frailty and disease variables observed in the three months to one year prior to the index month.

The independent variables were determined using a stepwise approach to select baseline covariates that are correlated with the NF stay outcome. The independent variables are drawn from the pre-index date data, i.e. prior to SCO enrollment.

POPULATION PROFILES

The SCO enrollee population used in the analyses is profiled in the table below. The enrolling population is reasonably stable in its composition. The 2007 cohort is distinguished by significantly higher rates of enrollment of nursing facility residents with higher levels of cognitive impairment and chronic diseases than observed in the other enrollment cohorts.

Pre-Enrollment Date/Index Date SCO Study Enrollee Characteristics

Enrollment Year	2004	2005	2006	2007	2008	2009
New Enrollees	666	2,208	2,915	2,250	1,886	2,139
Pre-Index Months Measures						
Medicare Sex						
Male	27%	31%	31%	33%	33%	33%
Female	73%	69%	69%	67%	67%	67%
Medicare Age						
Age 65-74	50%	51%	50%	48%	49%	51%
Age 75-84	36%	37%	36%	32%	32%	31%
Age 85+	14%	13%	15%	20%	18%	18%
Average Age	75.9	75.5	75.7	76.5	76.1	75.7
Medicare Race						
White	52%	55%	52%	59%	58%	52%
Black	10%	17%	16%	13%	12%	12%
Hispanic	32%	14%	12%	10%	9%	10%
Other/Unknown Race	6%	14%	19%	18%	21%	27%
County of Residence						
Bristol	13%	25%	19%	25%	21%	16%
Essex	43%	20%	11%	12%	10%	12%
Hampden	24%	7%	4%	6%	6%	9%
Middlesex	2%	5%	5%	7%	13%	19%
Norfolk	6%	4%	8%	6%	7%	6%
Plymouth	0%	17%	8%	5%	7%	3%
Suffolk	12%	21%	36%	24%	23%	23%
Worcester	0%	3%	9%	16%	12%	12%
Medicare Status						
Parts A & B	99%	99%	99%	99%	99%	98%
Medicare Part B Buy-in	97%	98%	96%	92%	91%	93%
LTSS Use/Status						

Enrollment Year	2004	2005	2006	2007	2008	2009
Community/Other	72%	82%	77%	66%	68%	74%
Community Long-Term Care	21%	14%	13%	16%	19%	24%
Nursing Facility/Institutional Long-Term Care	7%	4%	9%	19%	13%	2%
Cognitive Impairment from Claim Primary Diagnoses						
Alzheimer's/Chronic Mental Illness	45%	38%	41%	48%	43%	44%
Selected Service Utilization Types						
Acute Inpatient	14%	10%	10%	11%	11%	11%
Home Health	22%	14%	14%	18%	21%	28%
Assisted Living	6%	2%	1%	1%	2%	1%
Day Habilitation	15%	5%	6%	10%	10%	20%
Medicaid Waiver Program	5%	6%	6%	8%	8%	8%
Grouped JEN Frailty Scores						
0	3%	4%	4%	3%	5%	4%
1-3	42%	44%	45%	35%	41%	46%
4-6	38%	40%	36%	36%	36%	35%
7+	17%	12%	16%	26%	19%	15%
Population Average	4.1	3.8	4.0	4.6	4.1	3.9
Selected Chronic Diseases						
Diabetes	49%	46%	42%	47%	45%	41%
Ischemic Heart Disease	40%	34%	36%	38%	34%	30%
Cerebral Vascular Disease	16%	14%	14%	18%	16%	16%
Chronic Respiratory Disease	28%	31%	29%	31%	27%	26%
Arthritis	36%	33%	29%	31%	28%	28%
Congestive Heart Failure	20%	15%	15%	18%	15%	13%
Selected Chronic Disease Count						
0	19%	19%	21%	19%	21%	26%
1-2	49%	55%	56%	51%	54%	51%
3-4	27%	22%	20%	25%	21%	20%
5-6	5%	4%	4%	5%	4%	3%
Population Average	1.9	1.7	1.6	1.8	1.7	1.5

Comparisons between case and control population in the months leading up to the index date show similar patterns of service use. Below is a summary of Medicare expenditures and service utilization in the three-month baseline period.

Medicare Payments and Utilization: Three-Month Pre-Index Average Costs and Utilization, SCO Enrollees vs. Controls 2004-2010

	2004-2009 SCO Enrollees	2004-2009 Valid Controls
N	12,064	35,765
Mean per Patient Medicare Payments		
Ambulance/Transport	$24	$34
Home Health	$98	$75
Hospice	$6	$31
Inpatient Acute	$296	$311
Inpatient Chronic	$37	$57
Outpatient	$42	$42
Other Practitioner	$11	$12
Physician	$129	$132
Part B Drug	$68	$74
Skilled Nursing Facility	$131	$125
Durable Medical Equipment	$23	$25
Lab/Radiology/Testing	$67	$65
Total	$1,146	$1,180

There were 10,335 SCO enrollees and 29,169 controls in 2004-2009, excluding those with pre-index nursing home residence. This was the population deemed eligible for nursing home and survival analysis through 2010.

The available study population – both SCO enrollees and controls – fell progressively in the course of the observation period, mainly because of mortality and administrative censoring at the end of follow-up. The table below shows the cohorts' attrition rates during follow-up. These rates include death, change in SCO or Medicare status, and censorship at the end of the observation period. Except for the first follow-up year, the attrition rates in the two cohorts were similar. The difference in the first year was due to the large number of SCO discontinuations (11.6%).

Attrition in the Pooled SCO Enrollee and Matched Control Cohorts by Month of Follow-up

Month from Index Date	Beginning of Year		Death		Medicare Dual Enrollment Discontinue		Change in SCO/HMO Status		Censored at End of Study		Total Attrition	
	SCO Enrollee	Control	SCO	Ctrl	SCO	Cntrl	SCO	Cntrl	SCO	Cntrl	SCO	Cntrl
12	10,335	29,169	2.8%	3.8%	0.3%	0.6%	11.6%	3.1%	0.0%	0.0%	14.7%	7.5%

24	8,811	26,986	3.4%	3.8%	0.1%	0.5%	5.4%	4.1%	17.1%	16.6%	26.0%	24.9%
36	6,522	20,254	3.4%	4.1%	0.0%	0.3%	4.9%	3.8%	17.5%	17.5%	25.7%	25.7%
48	4,846	15,048	4.0%	4.4%	0.0%	0.3%	3.9%	3.5%	23.4%	22.8%	31.3%	30.9%
60	3,331	10,397	4.1%	4.2%	0.0%	0.2%	2.4%	3.2%	47.0%	47.9%	53.4%	55.5%
72	1,552	4,622	4.2%	3.6%	0.0%	0.1%	1.3%	1.5%	76.7%	75.1%	82.2%	80.4%
84	277	905	1.1%	1.5%	0.0%	0.1%	0.0%	0.9%	98.9%	97.5%	100.0%	100.0%

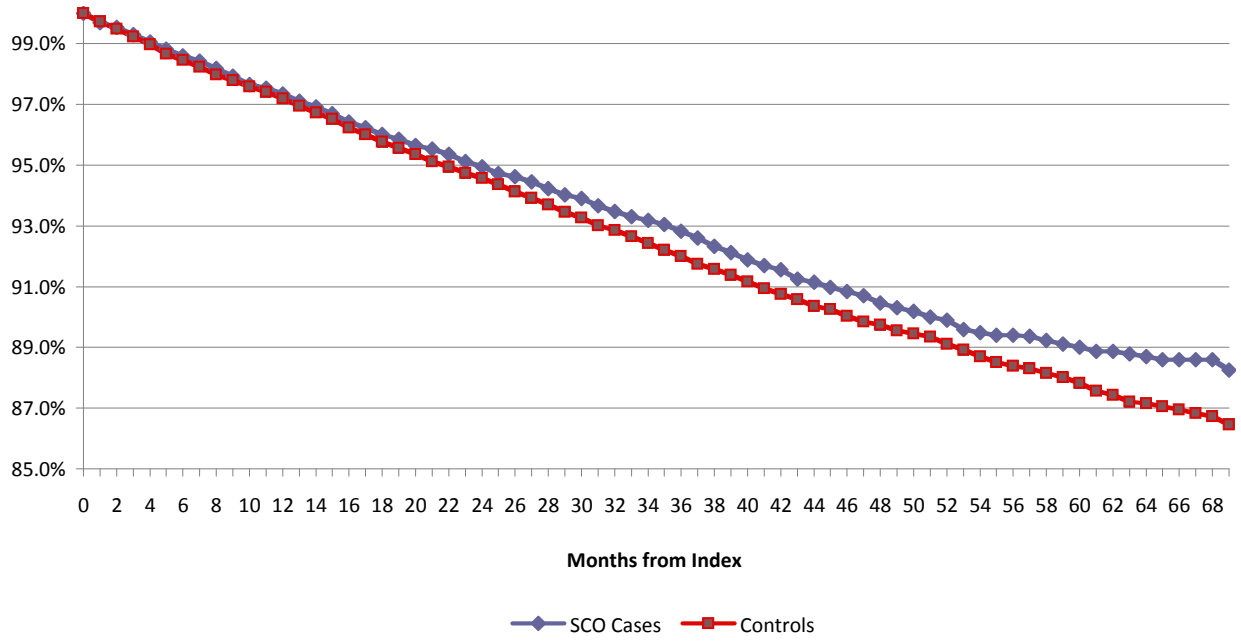
NURSING FACILITY OUTCOMES

The survival curves and model results are consistent with the hypothesis that SCO provides greater levels of supports for frail individuals since nursing facility entries for long-term stays and end-of-life care are both significantly reduced. Post-acute, short-stay NF utilization is unaffected and may be influenced more by hospital practice patterns than the availability of program supports in the community.

Long Stays in Nursing Facilities

Long-term nursing facility residence involves stays of ≥4 months. In the course of the observation period, 710 (6.9%) of SCO enrollees and 2,383 (8.2%) of controls experienced such episodes. In the descriptive analysis, this difference represents a 16% reduction in the SCO cohort. However, the mean time to a long-term nursing facility stay was slightly shorter for the SCO enrollees than for the controls (21.7 vs. 22.5 months, respectively), while the respective median times were 18 and 19 months.

Survival Distribution for Long-Stay Nursing Home Entry through 2010 for Qualifying 2004-2009 SCO Cases and Matched Controls



In the proportional hazards model, SCO enrollment was associated with a 16% reduction in the risk of long-term nursing facility stays (see table below). Other factors independently associated with reduced risk were day habilitation services (which promote independent living skills) and Medicare/Medicaid dual eligible status ≥6 months prior to the index date. Conversely, a high baseline JEN frailty score was associated with much greater long-term stay risk, as were pre-index long-term support services (LTSS) other than day habilitation, and select chronic diseases (except for diabetes).

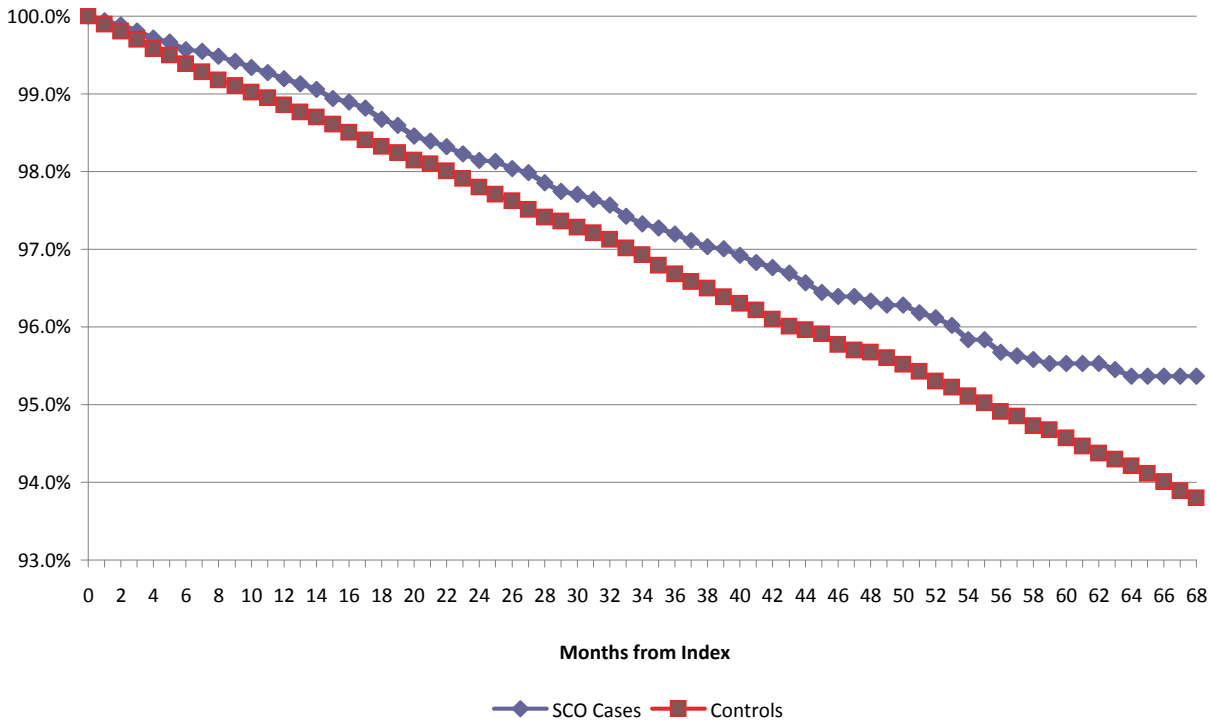
Proportional Hazards Model: Baseline Risks for Long-Stay Nursing Home Entry through 2010 for Qualifying 2004-2009 SCO Cases and Matched Controls

Pre-Index Factor	**Hazards Ratio**	**Confidence Limits**		***P* Value**
SCO Enrollee	0.84	0.77	0.91	<.001
1-3 Months Pre-Index				
Acute Inpatient Utilization	1.21	1.08	1.36	.001
Home Health Utilization	2.19	1.97	2.43	<.001
Assisted Living Utilization	3.86	3.20	4.67	<.001
Day Habilitation Utilization	0.79	0.69	0.89	<.001
Medicaid Waiver Program Utilization	2.06	1.86	2.29	<.001
Nursing Facility Utilization	1.48	1.05	2.11	0.03
Skilled Nursing Facility Utilization	1.26	0.98	1.63	0.08
July-December of Year Prior to Index				
Medicare FFS-Medicaid Dual Eligibility	0.79	0.69	0.90	<.001
1-12 Months Pre-Index				
JEN Frailty Score 4-6	1.50	1.37	1.65	<.001
JEN Frailty Score 7+	1.86	1.63	2.13	<.001
Diabetes	0.92	0.85	0.99	0.03
Coronary Artery Disease	1.10	1.01	1.20	0.04
Cerebrovascular Disease	1.37	1.24	1.51	<.001
Chronic Obstructive Pulmonary Disorder	1.14	1.05	1.24	0.002
Congestive Heart Failure	1.54	1.40	1.71	<.001

End-of-Life Stays in Nursing Facilities

End-of-life nursing facility residence involves stays that begin within four months of the patient's death. In the course of the observation period, 273 (2.6%) of SCO enrollees and 1,033 (3.5%) of controls experienced such episodes. In the descriptive analysis, this difference represents a 26% reduction in the SCO cohort. The mean time to a long-term nursing facility stay was nearly equivalent for the SCO enrollees and the controls (23.9 vs. 24.2 months, respectively), while the respective median times were 21 and 22 months.

Survival Distribution for End-of-Life Nursing Home Entry through 2010 for Qualifying 2004-2009 SCO Cases and Matched Controls



In the proportional hazards model, SCO enrollment was associated with a 23% reduction in the risk of long-term nursing facility stays (see table below). Other factors independently associated with reduced risk were day habilitation services (37% reduction in end-of-life stays) and Medicare/Medicaid dual eligible status ≥6 months

prior to the index date. Conversely, a high baseline JEN frailty score was associated with much greater long-term stay risk, as were certain pre-index LTSS and select chronic diseases (again except diabetes).

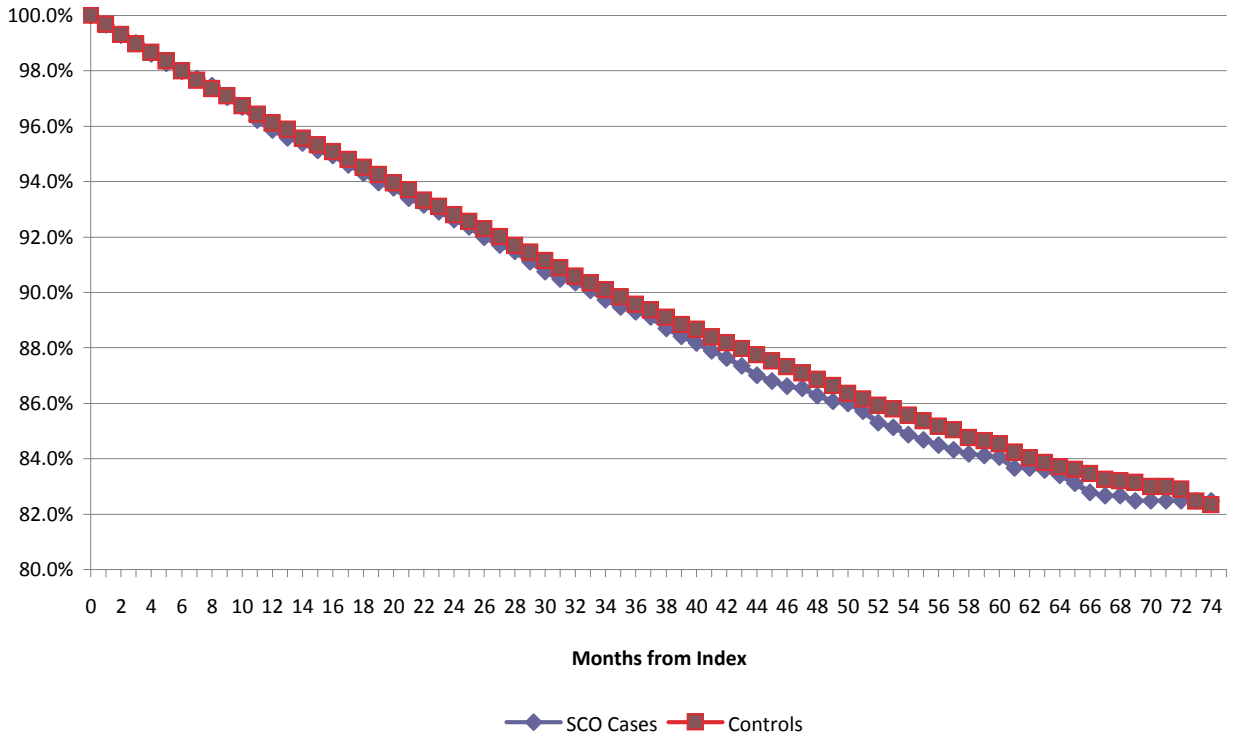
Proportional Hazards Model: Baseline Risks for End-of-Life Nursing Home Entry through 2010 for Qualifying 2004-2009 SCO Cases and Matched Controls

Factor	Hazard Ratio	Confidence Limits		p-value
SCO Enrollee	0.77	0.67	0.88	<.001
1-3 Months Pre-Index				
Home Health Utilization	2.31	1.98	2.69	<.001
Assisted Living Utilization	1.76	1.23	2.52	.002
Day Habilitation Utilization	0.63	0.51	0.77	<.001
Medicaid Waiver Program Utilization	1.48	1.25	1.77	<.001
1-12 Months Pre-Index				
JEN Frailty Score 4-6	1.34	1.17	1.54	<.001
JEN Frailty Score 7+	1.83	1.52	2.22	<.001
Diabetes	0.89	0.79	1.00	.05
Coronary Artery Disease	1.19	1.04	1.36	0.01
Cerebrovascular Disease	1.36	1.21	1.54	<.001
Chronic Obstructive Pulmonary Disorder	0.76	0.67	0.86	<.001
Congestive Heart Failure	1.95	1.68	2.26	<.001

Short Stays in Nursing Facilities

Short-term nursing facility residence involves stays of <4 months that end with discharge back into the community. As mentioned, these stays frequently involve rehabilitation services after acute hospitalizations. In contrast to the two other categories of nursing facility residence, there was no significant difference in the rates associated with the SCO and control cohorts. Some 1,031 (10.0%) of SCO enrollees and 3,046 (10.4%) of controls experienced such episodes. The mean time to a short-term nursing facility stay also was essentially equivalent for the SCO enrollees and the controls (21.7 vs. 22.0 months, respectively), while the respective median times were 18 and 19 months.

Survival Distribution for Short-Stay Nursing Home Entry through 2010 for Qualifying 2004-2009 SCO Cases and Matched Controls



In the proportional hazards model, SCO enrollment was not associated with any reduction in the risk of short-term nursing facility stays, nor was any other factor (see

table below). However, high baseline JEN frailty score was once again associated with much greater short-stay risk, as were certain pre-index LTSS, acute hospitalization and select chronic diseases (except cerebrovascular disease).

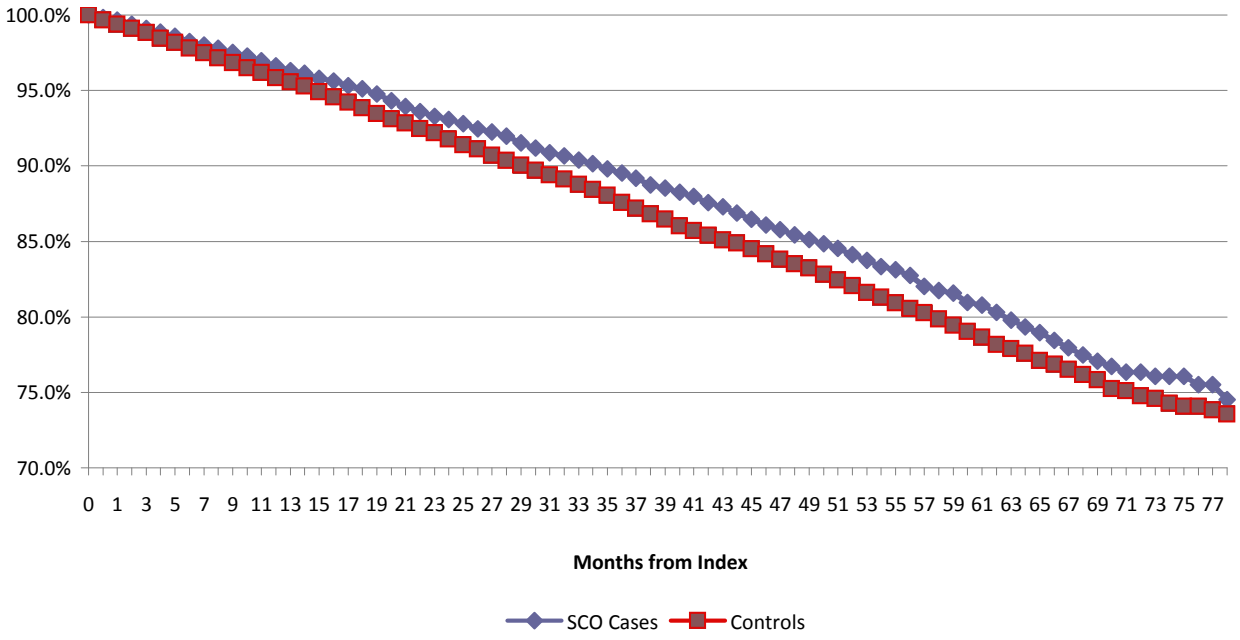
Proportional Hazards Model: Baseline Risks for Short-Stay Nursing Home Entry through 2010 for Qualifying 2004-2009 SCO Cases and Matched Controls

Factor	Hazard Ratio	Confidence Limits		p-value
SCO Enrollee	1.00	0.93	1.07	0.97
1-3 Months Pre-Index				
Acute Inpatient Utilization	1.15	1.04	1.28	0.01
Home Health Utilization	1.71	1.55	1.89	<.001
Assisted Living Utilization	1.26	0.98	1.62	0.07
Day Habilitation Utilization	0.89	0.79	1.00	0.06
Medicaid Waiver Program Utilization	1.46	1.32	1.62	<.001
July-December of Year Prior to Index				
Medicare FFS-Dual Eligibility	0.69	0.62	0.78	<.001
1-12 Months Pre-Index				
JEN Frailty Score 4-6	1.36	1.26	1.48	<.001
JEN Frailty Score 7+	1.53	1.35	1.72	<.001
Diabetes	1.11	1.04	1.19	.002
Coronary Artery Disease	1.31	1.21	1.41	<.001
Cerebrovascular Disease	1.09	1.00	1.20	0.06
Chronic Obstructive Pulmonary Disorder	1.27	1.18	1.36	<.001
Arthritis	1.33	1.24	1.42	<.001
Congestive Heart Failure	1.31	1.20	1.44	<.001

MORTALITY

In the course of the 2004-2010 observation period, 1,208 (11.7%) of SCO enrollees and 4,224 (14.5%) of controls died. In the descriptive analysis, this difference represents a 19% reduction for the SCO cohort. Among the deceased members of the cohorts, the mean time to death was slightly longer for the SCO enrollees than for the controls (27.3 vs. 26.0 months, respectively), while the respective median times were 24 and 23 months. The interpretation of the model results is that mortality risk in the study period is reduced as adjusted for censored data. For events that are certain to happen the risk reduction is understood as a deferment of the outcome. SCO cases will live longer, leading to an increase in the average age of SCO enrollees compared to the matched controls. As the SCO case cohort ages in comparison to the surviving controls the SCO mortality rate will necessarily increase.

Cohorts' Survival Distribution through 2010 for Qualifying 2004-2009 SCO Cases and Matched Controls



The instability in the survival curves in the later follow-up months is an artifact of the restricted number of study participants with ≥6 years of follow-up. At month 72, there

were 1,522 SCO enrollees and 4,622 matched controls available for observation, but by month 84, those numbers had declined to 277 and 905, respectively, and were drawn from case/control pairs formed in 2004. It can be hypothesized the apparent convergence in the later months is due to the aging of the SCO population in comparison to the controls.

In the proportional hazards model, SCO enrollment was independently associated with a 17% reduction in the risk of death (see table below). Otherwise the nursing facility pattern repeated itself. Long-term pre-index Medicare FFS-Medicaid dual eligibility was found to have an independent association with reduced mortality. In contrast, a pre-index acute inpatient hospital stay and high baseline JEN frailty score were factors independently associated with large increases in mortality risk, as were certain LTSS, and select chronic diseases (with the notable exception of arthritis).

Proportional Hazards Model: Baseline Risks for Mortality through 2010 for Qualifying 2004-2009 SCO Cases and Matched Controls

Factor	Hazard Ratio	95% Confidence Limits		p-Value
SCO Enrollee	0.83	0.78	0.88	<.001
1-3 Months Pre-Index				
Acute Inpatient Utilization	1.49	1.38	1.62	<.001
Home Health Utilization	1.94	1.81	2.08	<.001
Assisted Living Utilization	1.29	1.06	1.56	0.01
Medicaid Waiver Program Utilization	1.52	1.40	1.66	<.001
July-December of Year Prior to Index				
Medicare FFS-Medicaid Dual Eligibility	0.81	0.73	0.89	<.001
1-12 Months Pre-Index				
JEN Frailty Score 4-6	1.26	1.17	1.35	<.001
JEN Frailty Score 7+	1.58	1.43	1.75	s
Diabetes	0.93	0.88	0.99	0.02
Coronary Artery Disease	1.22	1.14	1.30	<.001
Cerebrovascular Disease	1.16	1.08	1.26	<.001
Chronic Obstructive Pulmonary Disorder	1.41	1.33	1.50	<.001
Arthritis	0.74	0.69	0.79	<.001
Congestive Heart Failure	1.75	1.62	1.88	<.001

IMPLICATIONS

The proportional hazard model associated SCO enrollment with a 16% reduction in overall long-stay NF entry risk. However, the descriptive time curve for long-stay nursing facility entry suggests that 18 months of SCO enrollment is required before the program has an observable effect on this type of nursing facility residency.

In comparison, the risk of nursing facility utilization for end-of-life care is observable after six months in SCO, with a 23% reduction in the proportional hazard risk for NF entries of this type. This result is similar for the observed survival benefit in SCO enrollees: a 19% reduction in risk of death, with the intercohort difference first observed six months after SCO enrollment. The SCO impacts on end-of-life NF residency and mortality are almost certainly related. The more rapid appearance of the SCO benefit pertaining to these two events is due to the acute nature of health crises that precede death and the potential for greater community care available to SCO enrollees. In contrast, long-stay nursing facility entry is connected to chronic conditions that debilitate patients over a longer time frame and require a sustained intervention to avoid.

The descriptive survival curve and the model show no SCO effect on short-stay NF entries. These types of stays frequently follow hospitalizations for acute conditions. Short-term stays in this case are rehabilitative in nature. Note that acute hospitalizations in the three months prior to SCO enrollment substantially raise the risk of short-stay residency post-enrollment.

For all types of nursing facility entry and for mortality, too, pre-index diagnoses and community-based NF substitution services are highly correlated with future outcomes in SCO enrollees. These factors' independent effect on SCO enrollee outcomes suggests that SCO-enhanced services may not be able to avoid intensive health service utilization in the highest-risk new enrollees. This possibility is further supported by the time lag in

observing the SCO-associated reduction in nursing facility entry and mortality. This lag helps to gauge the SCO program exposure necessary to improve patients' service utilization.

A major factor missing from this analysis is a demonstration of the mechanism by which the SCO program reduces NF entries. Since Medicare and Medicaid managed care programs do not report service utilization data, it is not currently feasible to establish the mechanism behind our observations. This study is therefore "programmatic" in nature as opposed to service-specific. The areas not covered in the analysis due to lack of utilization data places a greater burden on effective control selection to ensure the validity of the model results.

Rather than evidence of SCO's beneficial effect, the difference in mortality between SCO enrollees and the controls could be interpreted as a sign that some unobserved cohort selection bias did occur. However, validity of the study conclusions are supported by the confirmation of the study's approach found in the academic literature, the variation of the SCO benefit according to nursing entry type, and the time relationship of the findings to SCO enrollment. Most likely, SCO enrollees have better survival than comparable non-enrollees due to the care improvement brought about by integrating Medicare and Medicaid coverage – the same underlying proposed explanation for the long term nursing home avoidance effect.

SCO has represented a sort of "black box" because of the lack of service utilization data, but that situation is changing. The Centers for Medicare & Medicaid studies this year is implementing its Encounter Data System to record service utilization by members of Medicare managed care plans. This new system will represent a major breakthrough for healthcare policy research. In particular, it will enable a comparative assessment of SCO enrollees' hospitalizations, physician visits and other Medicare-covered events. It is anticipated that the encounter data will also include records of services that are traditionally Medicaid covered and new service types unique to the SCOs. The next

step in the current research, the effect of SCO enrollment on hospitalization, will help explain the nursing home and mortality reductions discussed here as well as provide further information on SCO's overall advantages.

APPENDIX: SUPPORTING LITERATURE

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