Summary of Findings

Anne Tumlinson Innovations (ATI) modeled the aggregate and per capita 2016 Medicare fee-for-service (FFS) savings *attributable to reduced inpatient hospitalizations* if the rate of hospitalizations among a frail group of Medicare beneficiaries could be reduced to the level that Juniper Communities achieves for its resident population, through its integrated service delivery care model, Connect4Life.
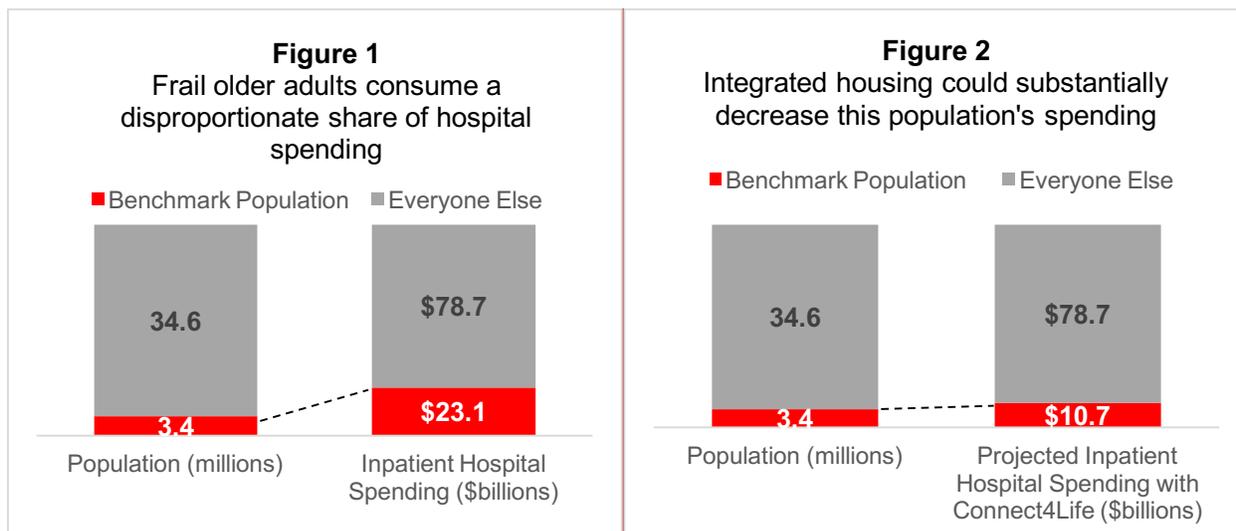
As Table 1 shows, ATI found that, at the hospitalization rate Juniper Communities achieves, Medicare would save between $10.0 and $15.3 billion on annual aggregate hospital spending and between $2,912 and $4,472 on a per capita basis for the 3.4 million frail Medicare beneficiaries ATI identified as being most similar to the Juniper resident population. For the Juniper study population of about 1,350 residents, the lower hospitalization rate generates between $3.93 and $6.04 million in savings on inpatient hospitalizations.

Table 1: Estimated Hospital Inpatient Savings to Medicare of Connect4Life			
	Per Capita Savings	**Juniper Population Aggregate Savings***	**Medicare Population Aggregate Savings**
Low-End Estimate (0.28 avoided hospitalizations per person)	$2,912	$3.93 million	$10.0 billion
Mid-Range Estimate (0.35 avoided hospitalizations)	$3,640	$4.93 million	$12.4 billion
High-End Estimate (0.43 avoided hospitalizations)	$4,472	$6.04 million	$15.3 billion

*Applies per capita savings derived from study population of 471 full year residents – see methods below.

The mid-range estimates of hospital savings are attributable to the statistically significant difference between the benchmark population's inpatient hospitalization rate of 0.65 and the Juniper reported rate of 0.30. ATI used a nationally representative sample of FFS Medicare beneficiaries to create a benchmark population similar to the Juniper residents in frailty, as measured by functional limitations in performing one or more activities of daily living (ADLs) or having cognitive impairment. The benchmark excludes dual eligibles to more closely match the socioeconomic status of Juniper residents.

As Figure 1 shows, the benchmark population represents only 10 percent of the Medicare population but accounts for 25 percent of inpatient hospital spending. However, as Figure 2 shows, if the benchmark population's rate of hospitalizations dropped by half – through investments in integrated care interventions – the overall Medicare FFS spending on hospital care would drop by 12 percent and this population would be consuming a share of hospital spending resources commensurate with its portion of the overall Medicare population.

Figure 1
Frail older adults consume a disproportionate share of hospital spending

■ Benchmark Population ■ Everyone Else

34.6

$78.7

3.4

$23.1

Population (millions) | Inpatient Hospital Spending ($billions)

Figure 2
Integrated housing could substantially decrease this population's spending

■ Benchmark Population ■ Everyone Else

34.6

$78.7

3.4

$10.7

Population (millions) | Projected Inpatient Hospital Spending with Connect4Life ($billions)

The results of this analysis – particularly the finding that the hospitalization rate for Juniper residents is not statistically different from the rate for the overall Medicare population (see Table 3 below) – indicate a strong possibility that the Connect4Life model is positively impacting hospital outcomes.

Health policy and business leaders recognize that the U.S. must fundamentally change how it delivers healthcare to the sickest and most expensive individuals. The Centers for Medicare and Medicaid Services (CMS) has devoted significant resources to designing and implementing new payment models to incentivize delivery system change.

And yet, very little evidence has emerged that points to the effectiveness of any particular intervention in bending the cost curve and delivering value to "high-need, high-cost" Medicare beneficiaries.[1] As health policy and business leaders search for scalable strategies to identify the "hot spots" of healthcare spending and address super-utilizers' social and support needs, this work raises the need to examine seniors housing as an important point of intervention and research.

Seniors housing is "home" to about 1.6 million high need older adults. The typical resident enters in her 80s, has multiple chronic conditions, and has cognitive and functional impairment.[2] This residential setting not only offers economies of scale in delivering services at home, such as enhanced primary care, it can also serve as a hub that closely monitors changing conditions and individual needs, and then organizes and integrates the full range of medical and long-term services and supports to meet those needs. These services can range from pharmacy, therapy, and radiology to nutrition, transportation, and personal care and social support.

Population health demonstrations and research must consider the opportunity that service-enriched housing offers in reforming care delivery to high-need, high-cost older adults. ATI recommends that CMS and others conduct research on the impact of care integration in seniors housing, and subsequently develop demonstrations and pilot programs that encourage and reward seniors housing organizations seeking to integrate care on behalf of their residents.

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[1] B. Vaida (2017) "For Super-Utilizers, Integrated Care Offers A New Path," *Health Affairs* 36(3):394-397. doi: 10.1377/hlthaff.2017.0112
[2] V. Freedman and B. Spillman (2014) "Disability and Care Needs Among Older Americans," *Milbank Quarterly* 92(3):509–541. doi: 10.1111/1468-0009.12076

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Methodology

Juniper Communities offers assisted living and memory care in 15 communities located in Pennsylvania, New Jersey, Colorado and Florida. Juniper's integrated services program, Connect4Life, provides residents with *on-site comprehensive therapy, primary care, pharmacy and lab services*, which it integrates with other health and supportive housing services using a "high-tech/high-touch" communications protocol that transfers information through an electronic health record and coordinates care through a human navigator.

The following describes the methodology by which ATI compared Juniper residents' hospital outcomes to those of similarly frail Medicare beneficiaries using the 2012 Medicare Current Beneficiary Survey (MCBS) Cost and Use file, a nationally representative annual survey with detailed healthcare utilization data for 10,000 Medicare FFS beneficiaries.

Creating the Juniper Study Population Parameters

ATI selected a population of 471 Juniper residents who reside at one of ten Juniper communities, receive services through Connect4Life, and have been living at the community for at least 12 consecutive months.

Juniper has 15 communities. ATI excluded from the study five Juniper sites that provide exclusively memory care because of concerns about the ability to match accurately in the MCBS the level of care needs among a population defined exclusively by severe dementia.

The total Juniper resident population across all Juniper communities, at any point in time, is about 1,350.

Creating the MCBS Benchmark Population

The benchmark population is limited to individuals enrolled in the fee-for-service population because the managed care enrollees' claims data is not directly available.[3]

In order to compare the inpatient hospital utilization of Juniper residents to that of the benchmark population, it was necessary to construct an analytical subgroup of MCBS respondents that mirror the underlying characteristics of the Juniper population. The following criteria were applied to construct a similarly frail MCBS Benchmark population:

- Exclude nursing home residents.
- Exclude individuals under age 65.
- Exclude individuals eligible for Medicaid. Juniper Communities is a private pay seniors housing organization, and therefore attracts higher income individuals. Although some Juniper residents receive Medicaid reimbursement for their care in certain states, ATI took a conservative approach to creating a benchmark population to avoid overestimating the benchmark hospitalization rate. Notably, however, when ATI tested including dual eligibles in the benchmark, the hospitalization rate was not statistically significantly different from the population without duals.
- Limited to people with functional impairment: People who report receiving help with 1+ ADL OR report cognitive impairment.

The distribution of characteristics is similar across the benchmark group and Juniper residents (See Table 2).

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[3] MCBS offers imputed utilization for managed care enrollees based on survey respondents' self-reported service use, but ATI did not include this data source for this analysis.

Table 2: Comparing Juniper Residents to the Medicare Population			
	All Medicare Beneficiaries	**Juniper Residents**	**Medicare Benchmark Population**
Population Size	50.04 million (2012)	N/A	3.36 million (2012)
Sample Size	10,547	471	795
Average Age	N/A	87 years	N/A
<65	17%	2%	0%
65-74	46%	6%	36%
75-84	26%	18%	34%
85+	11%	73%	30%
Average Number of ADLs	0.87	1.9	1.75
0 ADLs	83%	18%	13%
1 ADL	8%	27%	39%
2 ADLs	4%	18%	19%
3 ADLs	3%	14%	16%
4 ADLs	2%	22%	13%
Reports Cognitive Impairment	4%	34%	30%
Medicaid Eligible	18%	0%	0%

Table 3: Utilization Outcomes			
Outcome	**Juniper Residents**	**MCBS Benchmark (95% C.I)**	**All FFS Medicare Beneficiaries (95% C.I.)**
Hospitalization Rate (Events per person per year)	0.30	0.65 (0.58-0.73)	0.28 (0.27–0.30)
Emergency Room Use (Events per person per year)	0.52	0.55 (0.49-0.60)	0.43 (0.41–0.45)

The Juniper hospitalization rate of 0.30 falls below the 95 percent confidence interval around the mean of 0.65 for the benchmark population. Despite being much frailer, Juniper residents have a similar hospitalization rate as the Medicare population overall. As discussed in a previous analysis comparing Juniper healthcare utilization to the benchmark population, the Juniper emergency room visit rate is lower than the benchmark, but the difference is not statistically significant.

Estimating the Value of Avoided Hospitalizations to the Medicare Program

In order to construct an estimate of the savings to Medicare of Juniper's Connect4Life intervention, ATI multiplied the number of avoided hospitalizations per enrollee by the average cost per hospitalization for the full Juniper population.

- 0.35 hospitalizations avoided per resident, per year
  - MCBS Benchmark: 0.65 hospitalization rate (95% CI: 0.58 - 0.73)
  - Juniper: 0.30 hospitalization rate
- Average spending per hospitalization: $10,399
  - MCBS estimate of spending per hospitalization for this population: $9,972 in 2012
  - Inflated 2012 spending per hospitalization to a 2016 value by applying a spending inflation factor calculated using the growth rate of per Medicare beneficiary spending

for hospital care between 2012 and 2016 in the National Health Expenditure Tables provided by CMS.
- Population in intervention: 471
- Total Juniper resident population: 1,350

Savings per person receiving Connect4Life: 0.35 x $10,399 = **$3,640**

Savings for Juniper study population: $3,640 x 471 = **$1.71 million**

Savings for full Juniper resident population: $3,640 x 1,350 = **$4.91 million**

To provide a range for the savings produced by Connect4Life, ATI constructed estimates based on the high and low ends of the 95% confidence interval for hospitalization rates in the MCBS Benchmark population.

- Low-End Estimate: 0.28 hospitalizations avoided per enrollee per year
    - Savings per person receiving Connect4Life: 0.28 x $10,399 = $2,912
    - Savings for Juniper study population: $2,912 x 471 = $1.37 million
    - Savings for full Juniper resident population: $2,912 x 1,350 = $3.93 million
- High-End Estimate: 0.43 hospitalizations avoided per enrollee per year
    - Savings per person receiving Connect4Life: 0.43 x $10,399 = $4,472
    - Savings for Juniper study population: $4,472 x 471 = $2.11 million
    - Savings for full Juniper resident population: $4,472 x 1,350 = $6.04 million

Estimating the Potential Value of Integrated Housing Interventions for Avoiding Hospitalizations in a Similarly Frail Medicare Population

In order to give a sense of the opportunity of integrated housing interventions to bend the cost curve for high-need, high-cost Medicare beneficiaries, ATI extrapolated the potential value of Connect4Life to the frail Medicare population that stands to benefit from this kind of approach.

- Savings per person receiving Connect4Life: $3,640
- Eligible population size: 3.42 million (see above "Creating the Medicare Benchmark Population")
    - 2012 MCBS estimate of eligible Medicare fee-for-service population: 3.36 million in 2012
    - Inflated 2012 population estimate to a value by applying the same growth rate as in the overall Medicare fee-for-service population between 2012 and 2016.

Savings projected to full Medicare population meeting the criteria: $3,640 x 3.42 million = **$12.4 billion**

ATI used the same approach as above to calculate a range of potential savings, creating estimates using the high and low ends of the 95% confidence interval.

- Low-End Estimate: 0.28 hospitalizations avoided per enrollee per year
    - Savings per person receiving Connect4Life: $2,912
    - Savings for full eligible Medicare population: $2,912 x 3.42 million = $10.0 billion
- High-End Estimate: 0.43 hospitalizations avoided per enrollee per year
    - Savings per person receiving Connect4Life: $4,472
    - Savings for full eligible Medicare population: $4,472 x 3.42 million = $15.3 billion

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Limitations

The following are limitations of this analysis.

- Lack of adjustment for geographic variation in healthcare utilization
Juniper communities are located in Colorado, Florida, New Jersey, and Pennsylvania. Healthcare utilization in these areas may differ substantially from the national average that is being used for the comparison group. ATI was not able to adjust for this factor, although the geographic effect is mitigated to some extent by combining residents across four diverse healthcare markets.

- Lack of data on chronic conditions
Juniper did not have complete enough information to do an appropriate match with the MCBS data for chronic conditions. The Juniper population may therefore differ from the benchmark population (i.e., be more or less sick) in a way that has not been accounted for in this analysis.

- Different sources for Juniper and MCBS utilization data
MCBS data on hospital and emergency room utilization is captured from Medicare claims. Data on Juniper utilization is derived from Juniper's electronic medical record system, which is populated by the resident's on-site primary care team. These two sources of data may not be comparable.

- Different methods for assessing cognitive impairment
MCBS data on cognitive impairment is based on the survey respondents' self-report of a diagnosis of Alzheimer's or dementia, and may undercount the prevalence of dementia in the benchmark population. Data on Juniper resident's cognitive impairment is based on an assessment conducted by the primary care team, and may therefore be more robust.

- No adjustment for length of morbidity and time until death
ATI did not adjust for differences in the length of morbidity or time until death. The Juniper sample included only individuals who were residing at Juniper at the time the data was pulled and had been there for the past 12 months. This decision ensured a full 12 months worth of medical record data on hospitalizations – so that ATI could annualize the hospitalization rate. This means the Juniper sample may be skewed towards individuals who have been living for a longer period of time with high levels of LTSS need compared to the MCBS sample. There are no indicators in the MCBS sample about whether the individual who receives help has recently begun to need that help or who are near death. Additionally, individuals who had died during the year were not removed from the MCBS sample, and the MCBS sample may therefore be skewed more heavily towards higher levels of acuity.

- Unaccounted for drops in hospital utilization
The MCBS hospitalization rate is calculated using 2012 Medicare claims whereas the Juniper hospitalization rate comes from 2015-2016 data. The Medicare Payment Advisory Commission (MedPAC) notes declining per capita Medicare inpatient hospital utilization during that time period.[4] The ATI team looks forward to comparing more recent MCBS data

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[4] The Medicare Payment Advisory Commission (2017) "Report to the Congress: Medicare Payment Policy." Available at: http://www.medpac.gov/docs/default-source/reports/mar17_entirereport224610adfa9c665e80adff00009edf9c.pdf?sfvrsn=0

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to the 2012 to determine whether the high-need, high-cost population experienced the same decline in utilization as the overall population.

Discussion

Despite limitations inherent in the research approach, the Juniper study population's hospitalization rates are low enough relative to the overall Medicare population hospitalization rates to warrant additional study and consideration.

The Juniper Connect4Life intervention relies heavily on the use of an interdisciplinary team approach in that the primary care doctor or nurse practitioner works in close and ongoing collaboration with the care team, which includes an on-site pharmacist and care manager. Additionally, and perhaps most importantly, the co-location of the integrated care model with the assisted living residence enables the care team to monitor changing conditions on a daily basis. This provides a natural "hot spot" to engage in monitoring and service delivery for a concentration of high-need, high-cost Medicare beneficiaries.

The results of this analysis – particularly the finding that the hospitalization rate for Juniper residents is not statistically different from the rate for the overall Medicare population – indicate a strong possibility that the Connect4Life model is positively impacting hospital outcomes.

This study did not measure impacts on spending in other service categories. The savings in hospitalizations would be offset to some degree by increases in spending on primary care and care management. However, also not captured in the analysis are any savings that would likely be attributable to lower post-acute care use (from a decline in hospitalizations), reductions in poly-pharmacy, and reductions in use of specialists and surgical procedures.

Juniper Communities is demonstrating that there is significant potential in leveraging the senior living setting to bring integrated primary care and care management into the homes of high need, high cost seniors. ATI recommends that CMS and others interested in evaluating and scaling care delivery interventions for high-need, high-cost populations, study the impact of integrated interventions in the seniors housing context, and develop demonstrations and pilot programs that encourage and reward senior living organizations seeking to integrate care on behalf of their residents.

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Appendix: Data Sources and Variable Specifications

Data Sources

- Benchmark: 2012 Medicare Current Beneficiary Survey (MCBS) Cost and Use File
    - This was the most recent data available at the time the analysis was completed. 2015 data is expected to be released in Q317.
- Juniper Data
    - October 2015 – October 2016
    - Data collected by Juniper staff through resident assessments, level of care determinations, and electronic health records.

Variable Specifications

- MCBS Variables
    - **Medicaid Enrollment**: Medicaid enrollment is defined through self-report in the MCBS survey as well as through administrative data from the State MMA file of Dual Eligibles. For the purposes of this analysis, being on Medicaid reflects those who receive full and partial benefits.
    - **Activities of Daily Living (ADLs):** ADLs are defined in the MCBS as occurring when a respondent reported receiving help with an ADL with which they also reported having difficulty. This analysis includes only four ADLs in order to match to the four that are collected in the Juniper resident assessment: bathing, dressing, toileting, and transferring/mobility.
    - **Cognitive impairment:** Cognitive Impairment was defined through self-report from the survey. Respondents were asked whether they had ever been told by a doctor that they had a diagnosis of dementia or Alzheimer's Disease.
    - **Hospitalizations:** Hospitalizations are pulled from the Inpatient RIF file of the MCBS and are defined in the analysis as events per person per year.
    - **ER Visits:** ER visits are determined by claims from the Outpatient RIF file of the MCBS with Revenue Center Code values of 0450-0459 (Emergency Room) or 0981 (Professional Fees- Emergency Room). They are also defined in this analysis as events per person per year.
- Juniper
    - **Medicaid Enrollment**: Juniper does not systematically collect data on which residents are eligible for Medicaid, but it is a small share of their population, which tends to be higher income.
    - **Activities of Daily Living (ADLs):** ADLs are defined as occurring when a resident is assessed as needing assistance with bathing, dressing (including grooming), toileting, and transferring/mobility.
    - **Cognitive impairment:** Cognitive impairment was indicated for residents who live in memory care units attached to the 10 assisted living facilities or who have been assessed as requiring assistance and special approaches due to a behavior.
    - **Hospitalizations, ER Visits** were pulled manually by Juniper staff from resident electronic medical records.

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