

Large variation in the Quality of Care for Frail Older Adults

A National Cross-Sectional Study Based on the Senior Alert Quality Register

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Background/Objectives: Senior Alert (SA) is a national Swedish quality register aiming to prevent falls, bladder dysfunction, pressure ulcers, malnutrition, and poor oral health among people aged 65 and older. Adherence to SA varies across municipalities. This study explored whether differences in full-process compliance are associated with demographic, economic, staffing, or political factors using official statistics.

Methods: Ten municipalities with high and ten with low compliance compared with each other and compared to a reference group of 262 municipalities.

Results: High-compliance municipalities differed clearly from both low-compliance municipalities and the reference group. Low-compliance municipalities showed no significant differences compared with reference group. No group differences were found in care costs, staffing, or political governance.

Conclusion: High compliance may be linked to social stability within municipalities, potentially supporting improved care quality. However, the cross-sectional design of the study limits causal interpretation.

1. Introduction

While many older adults maintain good health and independence, an increasing proportion experience frailty and require complex care [1]. Addressing their needs often involves collaboration among multiple care providers and professionals. In Sweden in 2022, approximately 81,000 individuals resided in specialized housing for older adults, representing 3.5% of the population aged 65 and older. Of these, 62,000 were aged 80 or older, accounting for 11% of this age group [2].

According to projections, the population aged 80 years and older in Sweden is expected to increase by over 200%, reaching approximately 560,000 individuals by 2070 [3]. Residents in municipal residential care often have chronic conditions and disabilities, frequently accompanied by an elevated risk of adverse events such as falls, malnutrition, pressure ulcers, poor oral health, and bladder dysfunction [4, 5].

Various healthcare preventive interventions have demonstrated favourable effects, including the reduction of common health risks, prevention of adverse events, and improvements in overall well-being and patient safety [6-8]. Consequently, implementing effective preventive care strategies is a central governmental priority [9, 10]. However, this ambition poses a significant challenge to society, which is expected to grow in the coming decades. Key challenges include the need for increased personnel, enhanced competence, additional financial resources, and improved collaboration within and across organizations [11-13].

The care of older adults, encompassing both preventive and healthcare aspects and is governed by two separate legal spaces, the Social Services Act (SoL) [14] and Health Care Act (HSL) [15]. It means that the healthcare system is divided between these autonomous organizations. Each individual region and municipality manage independently their share of the responsibility, giving rise to variations in the quality of care provided to older adults and to the risk of unequal care and health among frail older across the country.

Sweden has approximately 150 National Quality Registries, which contain individual-level data on diagnoses, health issues, implemented interventions, and healthcare outcomes [16], aim to support the development of care practices and improve health outcomes, including saving lives [16]. Among them, Senior Alert (SA) is the largest, with about 100.000 unique individuals aged 65 and older registered annually [17, 18].

Senior Alert is primarily utilized in various care settings, particularly in municipal residential care, to promote a preventive approach. It focuses on risk screening for falls, bladder dysfunction, pressure ulcers, malnutrition, and poor oral health. This is followed by the implementation of preventive measures and subsequent follow-up as part of the so-called care preventive process (see Figure 1).

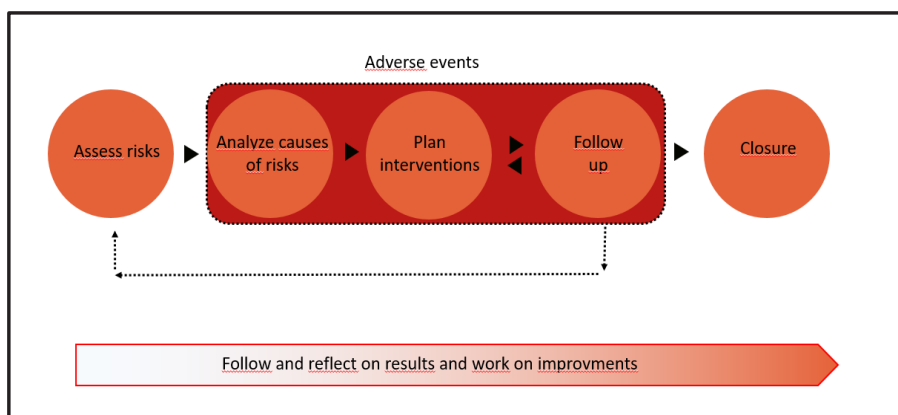


Figure 1. The preventive care process for preventing adverse events by identifying risks at an early stage [4].

In *Senior Alert* (SA), risks are identified in approximately 90% of all registered individuals. However, the complete care preventive process (Figure 1) is carried out in only about 60% of cases, with substantial variation among the municipalities connected to the registry. This incomplete implementation leaves residual risks for adverse events, potentially compromising patient safety for frail older adults. This study seeks to determine whether the observed differences in the use of SA are associated with characteristics of the municipalities.

The aim of this study was therefore to investigate whether differences in compliance to full care-process are associated with municipal characteristics. These characteristics include sociodemographic and socioeconomic indicators, financial resources, the organization of elderly care, and the political majority governing the municipality.

2. Materials and Methods

2.1 Data sources

This cross-sectional study is based on data from *Senior Alert* (SA) [4] and official Swedish statistics [3] [19]. It is the first phase in a mixed method study and will be followed by a second phase with a qualitative study design [20]. The study includes ten municipalities with high compliance and ten with low compliance to the complete care preventive process outlined in SA (Figure 1), as well as a reference group comprising other municipalities.

2.2 Selection of Municipalities

Of Sweden's 290 municipalities, 286 were registered in *Senior Alert* (SA) during

2019–2021. For this study, municipalities were selected based on their adherence to the complete care preventive process. Municipalities with fewer than 1,000 risk assessments ($n=91$) were excluded from the analysis (Figure 2). Additionally, the four largest municipalities - Stockholm, Gothenburg, Malmö, and Uppsala - were excluded due to their significantly larger populations compared to other municipalities in Sweden, as well as distinct variations in demographic characteristics.

2.3 Study design

Municipalities for analysis were chosen based on their compliance with the care preventive process in SA (Figure 1). Full registration was defined as adherence to four of the five risk areas for adverse events: falls, malnutrition, pressure ulcers, and poor oral health. Bladder dysfunction was excluded as it is a recently introduced risk area with relatively low registration rates. Compliance also required completion of all stages of the process when risks were identified. The compliance index was calculated as follows:

- 0.0: No risk screening conducted (stage 1).
- 0.33: Completion of stage 1 and one additional step.
- 0.67: Completion of stage 1 and two additional steps.
- 1.0: Full execution of all four stages.

Data from SA records for nursing homes (2019–2021) were analyzed to identify the ten municipalities with the highest proportion of complete registrations (high compliance index) and the ten with the lowest proportion (low compliance index). These 20 municipalities were then cross-referenced with official statistics from Statistics Sweden (SCB) [21] and the Municipality and County Council Database (KOLADA) [19]. Data presented are mainly based on information from SCB, except for data on number of caregiving staff per residential care unit and the number of nurses per resident in special residential care for older adults on weekdays in 2019, that are based on selfreported data from the municipalities in KOLADA.

Additionally, a comparative analysis was conducted between these 10 municipalities with high and low index, respectively, and the remaining 262 Swedish municipalities (excluding the four largest municipalities) to examine differences in these operational aspects (Figure 2).

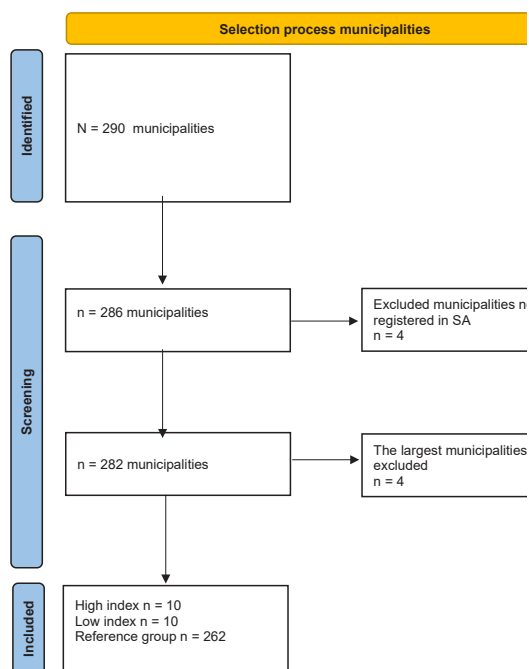


Figure 2. Flow chart of the selection process and reference municipalities.

*Corresponds to the four major Swedish counties: Stockholm, Malmö, Gothenburg and Uppsala. Those were excluded from the study due to their significantly larger populations compared to other municipalities and distinct variations in demographic characteristics.

2.4 Statistical analysis

Data were all continuous and the obtained values were expressed as means and standard deviations (SD). Student's t-test was performed to compare mean values when the ratio between the greater group SD to the smaller group SD was less than 2, and Welch t-test otherwise. The statistical analyses were performed using R version 4.3.0 The R Foundation for Statistical Computing. All statistical tests were two-tailed and levels of significance for P-values were <0.05 , <0.01 , <0.001 . To evaluate the extent to which our two groups of municipalities differ from the other municipalities in Sweden we made further comparisons between high-index and low-index municipalities, respectively with all other municipalities except for the 4 largest in size, Stockholm, Gothenburg, Malmö and Uppsala ($n=262$).

3. Results

3.1. *Characteristics of municipalities*

Comparison of characteristics between High-index and Low-index municipalities are shown in table 1, between High-index and the reference groups other municipalities (n=262) in Sweden, in Table 2, and between Low-index municipalities and the reference group other municipalities in Sweden, Table 3.

Municipalities with high index had significantly smaller populations compared to those with low index. Life expectancy for both women and men, as well as household income and the proportion of foreign-born residents, were also significantly lower in high-index municipalities. Additionally, these municipalities experienced negative population growth, in contrast to the positive population growth observed in low-index municipalities. The proportion of individuals with post-secondary education was lower, while the proportion of children with two Swedish-born parents was higher in high-index municipalities. No significant differences were observed between municipalities regarding unemployment rates, costs of residential care, staffing levels, or political majority.

In a comparison between high-index municipalities and other municipalities (n=262), significant differences were observed across all variables except for the proportion of unemployed individuals, costs of residential care, staffing levels, and the municipality's political majority.

No significant differences were observed between low-index municipalities and other municipalities.

Table 1. Comparison of characteristics between High-index and Low-index municipalities.

Characteristic of municipalities	High-index n=10	Low-index n=10	Difference
	Mean (SD)	Mean (SD)	P-value
Population 2021 (n)	11458 (7923)	26 379 (15 709)	0.019 ^b
Mean age 2021 (years)	46.3 (1.6)	44.4 (3.2)	0.112 ^b
Average life-expectancy women 2017-2021 (years)	83.4 (0.87)	84.4 (0.87)	0.016 ^a
Average life-expectancy men 2017-2021 (years)	79.6 (1.38)	81.1 (0.87)	0.011 ^b
Unemployment 2021 (%)	6.12 (1.63)	5.44 (1.23)	0.305 ^a
Household income 2020 (k SEK)	399.7 (15.1)	466.9 (37.6)	<0.001 ^b
Proportion of women in 2021 (%)	48.5 (0.6)	49.2 (1.1)	0.065 ^b
Population changes 2020 to 2021 (%)	-0.18 (0.6)	0.73 (0.8)	0.009 ^a
Proportion with post-secondary education 16-74 years 2021 (%)	23.3 (1.8)	31.1 (5.3)	<0.001 ^b
Proportion with two Swedish parents in 2021 (%)	81.1 (4.0)	74.6 (5.1)	0.005 ^a
Proportion foreign-born 18-64 years 2021 (%)	15.3 (3.0)	19.1 (3.1)	0.014 ^a
Proportion married in 2021 (%)	0.27 (0.08)	0.33 (0.08)	0.099 ^a
Proportion divorced in 2021 (%)	0.17 (0.06)	0.21 (0.05)	0.162 ^a
Cost of special residential care per older person, 2019 (k SEK/user)	1064 (291)	981 (225)	0.511 ^b
Number of caregiving staff per place in special residential care for older adults, weekdays 2019	0.305 (0.028)	0.329 (0.045)	0.196 ^b
Nurse per number of persons in special residential care for older adults, weekdays, 2019	0.050 (0.016)	0.045 (0.008)	0.401 ^b
Proportion conservative political majority (%)	30.0 (48.3)	50.0 (52.7)	0.388 ^a
Average proportion staff turnover 2019-2021 (%)	17.2 (4.2)	16.6 (3.3)	0.732 ^a

Data shown as mean and (SD). P-value for comparison between groups were made by Welch's t-test when not assume equal standard deviation (SD) for the groups. a Student's t-test b Welch t-test. NS non-significant, $p < 0.05$, $p < 0.01$, $p < 0.001$.

Table 2. Comparison of characteristics between High-index municipalities and the reference group other municipalities.

Characteristic of municipalities	High-index n=10	Other n=262	Difference
	Mean (SD)	Mean (SD)	P-value
Population 2021 (n)	11458 (7923)	29 915 (32 366)	<0.001b
Mean age 2021 (years)	46.3 (1.6)	43.7 (2.7)	0.002a
Average life-expectancy women 2017-2021 (years)	83.4 (0.87)	84.2 (1.00)	0.011a
Average life-expectancy men 2017-2021 (years)	79.6 (1.38)	80.6 (1.23)	0.012a
Unemployment 2021 (%)	6.12 (1.63)	6.03 (2.10)	0.895a
Household income 2020 (k SEK)	399.7 (15.1)	465.6 (95.7)	<0.001b
Proportion of women in 2021 (%)	48.5 (0.6)	49.2 (0.7)	0.004a
Population changes 2020 to 2021 (%)	-0.18 (0.6)	0.45 (0.9)	0.026a
Proportion with post-secondary education 16-74 years 2021 (%)	23.3 (1.8)	30.1 (8.7)	<0.001b
Proportion with two Swedish parents in 2021 (%)	81.1 (4.0)	73.0 (10.3)	<0.001b
Proportion foreign-born 18-64 years 2021 (%)	15.3 (3.0)	20.2 (8.0)	<0.001b
Proportion married in 2021 (%)	0.27 (0.08)	0.33 (0.06)	0.006a
Proportion divorced in 2021 (%)	0.17 (0.06)	0.21 (0.05)	0.010a
Cost of special residential care per older person, 2019 (k SEK/user)	1064 (291)	965 (262)	0.271a
Number of caregiving staff per place in special residential care for older adults, weekdays 2019	0.305 (0.028)	0.307 (0.041)	0.877a
Nurse per number of persons in special residential care for older adults, weekdays, 2019	0.050 (0.016)	0.043 (0.014)	0.134a
Proportion conservative political majority (%)	30.0 (48.3)	45.4 (49.9)	0.338a
Average proportion staff turnover 2019-2021 (%)	17.2 (4.2)	18.8 (5.3)	0.326a

Data shown as mean and (SD). P-value for comparison between groups where made by Welch's t-test when not assume equal standard deviation (SD) for the groups. a Student's t-test b Welch t-test. NS non-significant, p<0.05, p<0.01, p<0.001.

Table 3. Comparison of characteristics between Low-index municipalities and the reference group other municipalities

Characteristic of municipalities	Low-index n=10	Other n=262	Difference
	Mean (SD)	Mean (SD)	P-value
Population 2021 (n)	26379 (15 709)	29915 (32 366)	0.521 ^b
Mean age 2021 (years)	44.4 (3.2)	43.7 (2.7)	0.416 ^a
Average life-expectancy women 2017-2021 (years)	84.4 (0.87)	84.2 (1.00)	0.506 ^a
Average life-expectancy men 2017-2021 (years)	81.1 (0.87)	80.6 (1.23)	0.213 ^a
Unemployment 2021 (%)	5.44 (1.23)	6.03 (2.10)	0.377 ^a
Household income 2020 (k SEK)	466.9 (37.6)	465.6 (95.7)	0.928 ^b
Proportion of women in 2021 (%)	49.2 (1.1)	49.2 (0.7)	0.733 ^a
Population change from 2020 to 2021 (%)	0.73 (0.8)	0.45 (0.9)	0.334 ^a
Proportion with post-secondary education 16-74 years 2021 (%)	31.1 (5.3)	30.1 (8.7)	0.717 ^a
Proportion with two Swedish parents in 2021 (%)	74.6 (5.1)	73.0 (10.3)	0.380 ^b
Proportion foreign-born 18-64 years 2021 (%)	19.1 (3.1)	20.2 (8.0)	0.336 ^b
Proportion married in 2021 (%)	0.33 (0.08)	0.33 (0.06)	0.861 ^a
Proportion divorced in 2021 (%)	0.21 (0.05)	0.21 (0.05)	0.811 ^a
Cost of special residential care per older person, 2019 (k SEK/user)	981 (225)	965 (262)	0.857 ^a
Number of caregiving staff per place in accommodation in special residential care for older adults, weekdays 2019	0.329 (0.045)	0.307 (0.041)	0.117 ^a
Nurse per number of persons in special residential care for older adults, weekdays, 2019	0.045 (0.008)	0.043 (0.014)	0.679 ^a
Proportion conservative political majority (%)	50.0 (52.7)	45.4 (49.9)	0.776 ^a
Average proportion staff turnover 2019-2021 (%)	16.6 (3.3)	18.8 (5.3)	0.181 ^a

Data shown as mean and (SD). P-value for comparison between groups where made by Welch's t-test when not assume equal standard deviation (SD) for the groups. a Student's t-test b Welch t-test. NS non-significant, p<0.05, p<0.01, p<0.001.

4. Discussion

4.1. Discussion of results

This study aimed to explore whether differences in the quality of registration, expressed as compliance with all four steps of the preventive care process in SA are associated with variations among municipalities in terms of sociodemographic and socioeconomic indicators, financial resources, the organization of elder care, and the political majority governing the municipality.

High- and low-index municipalities were compared with each other and with a reference group of other Swedish municipalities, revealing several differences. High-index municipalities were characterized by lower population density, a smaller proportion of foreign-born residents, a higher proportion of children with two Swedish-born parents, a higher mean age, but lower life expectancy, educational attainment, and household income compared to low-index municipalities. Additionally, high-index municipalities showed higher unemployment rates, and negative population growth, in contrast to the positive population growth observed in low-index municipalities. No significant differences were found between high-index and low-index municipalities regarding costs of special residential care, staffing density, staff turnover, or political governance.

When comparing high-index municipalities with the reference group of other Swedish municipalities, the same differences were observed as in comparisons with low-index municipalities. However, no significant differences were found between low-index municipalities and the reference group, indicating that low-index municipalities align more closely with the average Swedish municipality compared to high-index municipalities.

The study demonstrates that high-index municipalities differ from the other municipalities with lower values for several sociodemographic, socioeconomic and indicators, and financial indicators. This may appear contradictory, given that they exhibit high-quality care in residential facilities for older adults, measured as strong adherence to the preventive care process in SA.

To interpret the current findings, it might be useful to consider them in the context of social stability, a concept that lacks a precise definition and is variably interpreted across disciplines such as economics and sociology [22] but typically conceptualized through theories of social integration, social control, and social roles, based on indicators of life structure and appropriate participation in society [23, 24]. Existing measures of social stability often assume an independent or additive relationship among different indicators [23].

To further explore the concept of social stability in the context of the present findings, high-index municipalities shared certain characteristics, such as being located in depopulated rural areas, many in the northern part of Sweden, with low population density and limited influx of new residents. In six out of ten high-index municipalities, the population density was fewer than 9 200

residents, compared to none of the low-index municipalities, placing the high-index municipalities among the smallest in Sweden. These circumstances align with theories of social stability, suggesting that many residents likely know each other through various connections. Consequently, social ties may exist between nursing home residents and care staff, potentially fostering greater individual involvement in the care of older adults.

The data also indicates that high-index municipalities have lower levels of education and household income compared to low-index municipalities and the reference group of other municipalities. It is plausible that in these municipalities, some younger individuals choose to remain rather than moving to larger cities for educational or career advancement opportunities. As a result, they may take up jobs available within the municipality, such as in municipal residential care of older adults. This could lead to longer tenures and contribute to the retention and development of competence among staff. However, the data do not support the hypothesis of lower staff turnover in these municipalities compared to low-index municipalities or the reference group of other municipalities.

4.2. Methodological considerations

A strength of the current study is the utilization of comprehensive and nationally encompassing official statistics, which hold significant relevance for investigations into municipally administered elderly care. Notably, the quality of official statistics in Sweden has demonstrated marked improvement in recent years, as documented by the Statistics Sweden report [25]. Furthermore, SA is the largest quality register in Sweden with 90 000 to 100 000 individual registrations per year. Additionally, SA has extensive coverage across 286 out of 290 municipalities in Sweden, ensuring a high level of representativity across municipalities. The methodology employed to assess the quality-of-care, however, warrants consideration. This approach was chosen due to its reliance on data readily available within the register of SA, coupled with the understanding that a comprehensive preventive care process offers favourable conditions for mitigating or addressing prevalent health issues among nursing home residents. Despite the strengths, several limitations should be acknowledged. Firstly, it should be noted that the design of the present study is cross-sectional, implying that only associations can be inferred. Notably, the reliance on self-reported data for various variables introduces the potential for disparities in quality across different municipalities. The reliability and statistical quality of these data may vary across municipalities. The quality depends on factors such as how well municipal IT systems are adapted for data entry and extraction, the functionality of routines for data registration, and the accuracy of data processing and review within municipalities and at the National Board of Health and Welfare (Socialstyrelsen). However, the National Board of Health and Welfare assesses

the reliability of the data to be sufficient for its intended statistical purposes.

Furthermore, previous research has highlighted the challenges faced by Registered Nurses (RNs) and assistant nurses, including high workloads and time constraints, which may adversely affect the completeness and quality of data [26]. Moreover, variations in competence and professional skills among staff members tasked with determining appropriate interventions further compound these challenges. Consequently, fewer recorded actions in SA may also reflect high workloads, time constraints and deficiencies in professional competence among RNs and assistant nurses. Compounding these issues, the availability of occupational therapists, physiotherapists and dietitians in nursing homes assisting in analysis and decision making is limited. Consequently, analysis of causes and decisions with regard interventions predominantly falls to RNs and assistant nurses. Another limitation is the utilization of aggregated data at the municipal level, which fails to capture variations within individual nursing homes. It is conceivable that certain nursing homes within both groups of municipalities perform either better or worse than the municipal average.

This study is part of a greater project [20]. In the next step we intend to explore dynamics described in the present study and their implications in a qualitative study for deeper understanding of factors that might explain differences in compliance to full care-process between municipalities.

5. Conclusions

High-index municipalities, which demonstrated robust adherence to the care preventive process, differed notably from both low-index municipalities and the broader reference group in ways that might initially appear counterintuitive. Yet, these municipalities achieved more complete registration and follow-through in SA, suggesting that structural or contextual elements - possibly related to social stability - may help facilitate preventive practices. Although no significant differences were observed in staffing levels, staff turnover, funding, or political governance between high- and low-index municipalities, between any of the three groups findings point to social stability as a potential explanatory factor. Nonetheless, definitive causal interpretations are limited by the cross-sectional design. Future research, including qualitative studies, is needed to further explore these dynamics and their implications for equitable and effective elderly care all over the country.

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