

Centralization of emergency hospital care is not associated with increased in-hospital mortality; a population-based cohort study

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Abstract

Background: We describe changes in the distance travelled, the utilization of emergency services, and the in-hospital mortality before and after the centralization of hospital emergency services in Denmark.

Methods: All unplanned non-psychiatric hospital contacts from adults (aged ≥ 18 years) in 2008 and 2016 are included. Analyses are age-standardized and conducted at a municipality level. The municipalities are divided into groups according to the presence of emergency hospital services.

Results: Municipalities where hospitals with emergency services have been closed differed by having the most significant increase in distance travelled from 2008 to 2016. All groups experienced a reduction in overall in-hospital mortality. The reduction in mortality was not present for acute myocardial infarct contacts from municipalities where hospitals with emergency services have been closed.

Conclusion: Our data do not suggest that hospital closures, and thereby increased travel distance, have contributed significantly as a barrier to emergency-care access and changes to in-hospital mortality.

Keywords

Acute Care, Care Policy, Hospital Mortality, Emergency Care Systems

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Key points

- To improve quality, the Danish healthcare system has centralized emergency departments to fewer hospitals
- All municipality groups decreased their use of emergency hospital care.
- All municipality groups experienced a reduction in overall in-hospital mortality.
- We found no general association between areas that have experienced a hospital emergency services closure and mortality
- Acute myocardial infarct contacts deviated from this generalization, but no firm conclusion about the cause can be drawn from this study

Introduction

Emergency departments in the Danish public healthcare system play a crucial role in treating acute patients, including those with minor injuries, trauma, and acute medical conditions.^{1,2} In 2007, the structure of emergency medicine in Denmark was reconfigured with the goal of delivering efficient, high-quality care around the clock. This was achieved by centralizing to larger emergency hospitals with increased catchment areas serving 200,000-400,000 people, reducing hospitals with emergency departments from around 40 to 21 by 2025.³ The reconfiguration was a government decision but was planned and executed by regional public health management. The hospital reconfiguration was previously not linked to overall changes in the length of hospital stay but was linked to shortened length of stay for weekend admissions.⁴ Likewise, the reconfiguration was not associated with

changes in in-hospital mortality⁵ but with preventing hospital readmissions.⁶

While the reconfiguration was intended to improve efficiency and quality of care, it also raised concerns about potential adverse effects on access to care for residents in affected municipalities. A Danish study predicted a 3.3 km increase in mean direct distance to an emergency-care hospital for patients residing near a closed hospital.⁷ Studies from other countries have linked policy-induced variations in hospital distance to increased mortality for patients with acute conditions,⁸ while others have not found significant effects on mortality.⁹ Therefore, an assessment of the reconfiguration of hospital emergency services should not only focus on patient safety outcomes but also on the accessibility and utilization of acute care for populations in different regions. The reconfiguration may improve efficiency

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through increased patient volume, learning, and specialization, but it could also lead to decreased geographical access to care. It could be expected that residents in the municipalities where acute care hospitals have been closed will have to travel longer distances for acute care, which may lead to fewer people seeking care. Additionally, patients with time-sensitive conditions will still require acute care, and the longer distances may affect their mortality rate.

This study examines the changes in distance travelled, utilization of hospital emergency services, and mortality before and after the centralization of hospitals in Denmark.

Methods

Population

This Danish population-based cohort study consists of data on all Danish unplanned non-psychiatric hospital contacts from adults (aged ≥ 18 years) in 2008 and 2016. These years were chosen as they represent a period before and after the centralization of acute hospital contacts to fewer hospitals. We included patients from four of the five regions. The Capital Region was excluded since the registration of acute contacts at hospital in this region includes a mix of acute primary-care contacts and emergency departments.¹⁰ To exclude contacts not using the acute hospital closest to their home address (e.g., people working or being on vacation far from home), a maximum cut-off of 110 km was made. Danish private hospitals treat 1%–3% of patients and have no unplanned contacts, therefore no data from private hospitals were included in the study.¹¹

Setting

All inhabitants in Denmark (5.8 million) have free access to public health care. Denmark is divided into five administrative regions and 98 municipalities, governed by publicly elected councils. The five regions manage, plan, and provide hospital health services.

In addition to reducing the number of hospital emergency services, all unplanned contacts were to be examined and treated at an emergency department. This was a relatively significant change locally at the hospital, since patients previously were admitted directly into a specific department based on their symptoms. As of June 2016, 17 of the 21 emergency departments were running.^{1,2} In some cases of emergency department closures, a downgraded version, called ‘injury clinics,’ treating only in the daytime (e.g., 0800–2200 hours), were established. These can also assess the need for referral to an emergency department for more severe injuries.³

In addition to the reorganization, other organizational changes were launched. To control patient influx, mandatory referrals through a general practitioner or a hotline were implemented progressively from October 2011 to April 2014, reducing unplanned hospital contacts.¹²

Data sources and size

This study is based on data from Statistics Denmark and Danish health registries, including the Danish Civil Registration System¹³ and the Danish National Patient Registry.¹⁴ Danish citizens have a unique personal identification number, enabling linkage between nationwide registers and other data sources.^{15,16} To present relative values for the number of contacts, data on the number of citizens living in every municipal during the first quarter of each year were extracted from StatBank Denmark.¹⁷

Outcomes

We describe changes in three outcome variables: distance, utilization of emergency hospital service, and in-hospital mortality. The distance travelled calculated as the shortest road distance from the home address to the address of the emergency department where the patient had his or her unplanned contact. The distance was aggregated to the municipality level. The utilization of emergency services was obtained by counting the number of contacts for each municipality per year. In-hospital mortality was aggregated to a municipality level.

Variables

To describe the cohort at a contact level, we extracted sex, age, year of contact, residential municipality, Charlson Comorbidity Index 1987 score,¹⁸ educational level, income, ethnicity, marital status, and time of day the health care was accessed for each patient.

Statistical methods

Based on the presence of an acute hospital after the reorganization, 69 municipalities were divided into three categories. The first group of municipalities, called “Never had,” included contacts from residents in a municipality with no hospitals with an emergency department in either 2008 or 2016. The “Never had” group consisted of 30 municipalities. The second group, called “Had in 2008,” consisted of 22 municipalities and included contacts from residents in a municipality who experienced a closure of access to emergency-care services within the municipality or a downgrading to an injury clinic between 2008 and 2016. The last 17 municipalities made up the third group, called “Always had,” which included municipalities with an emergency

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hospital service in 2008 and 2016. We present the characteristics of the patients in the three groups in absolute and relative numbers.

After determining if imputation was feasible based on patterns of missing data, we used the multiple mean matching imputation method if the distance was missing. The imputation was based on age, annual income, municipality of residency, weekday, and treating hospital using other contacts of the same and adjacent years. A sensitivity analysis of the imputation model fit was performed by comparing model estimates on both completed and complete data. To estimate the associations, we fitted generalized linear models with a gamma family and clustered robust standard error to account for non-negative values and municipality dependency. Each municipality's annual number of acute hospital contacts was used as weighting when estimating the change in distance travelled and in-hospital mortality. When estimating changes in the utilization of emergency services, the number of residents in each municipality was used as weighting.

To test the robustness of the results, we conducted subgroup analyses for patients we more often expected to be home when acute hospital care was needed. Specifically, we used contacts during the nighttime (2300 to 0700 hours). Further, we expected that time-sensitive conditions are more affected by increased distance to specialized treatment. Therefore, separate subgroup analyses were conducted for contacts diagnosed with acute myocardial infarction (AMI) and contacts diagnosed with aortic aneurysm. Because treatment for these conditions, to some extent, was centralized to a single hospital within each region before the study period, the 110 km distance limit was increased in relevant municipalities.

All utilization and mortality analyses were age-standardized using the age distribution in Denmark as in 2008. Utilization of emergency services is presented as contacts per 1000 population, and for aortic aneurysms as contacts per 100,000 population. The in-hospital mortality is presented per 1000 contacts.

All data management and analysis were processed in Stata 16.1, and a 5% statistically significant level was used in all analyses.

Patient and public involvement statement

Patients were not involved in the research question, study design, or the conduction of the study. Patients were not involved in the writing or editing of this study or invited to give feedback on readability.

Results

The unplanned hospital contacts included in the study resulted in 1,383,575 contacts, of which

690,746 were in 2008 (49.9%). Patients who resided in municipalities with hospital emergency services in both 2008 and 2016 were generally younger, had less comorbidity, had a lower income, and were more often living alone than those in the two other groups. This pattern was similar in 2008 and 2016.

The distance was missing for 8.7% of contacts and replaced with multiple imputations. Of these, 86.5% were in 2008, and most were related to specific municipalities. Comparative analyses showed some differences (due to the skewed distribution of missing data) but were irrelevant to the overall conclusions and therefore not reported.

In 2008, the median distance from patients' homes to the acute-care hospital was 17 km (95% confidence interval (CI): 13.9; 20.1). This increased by 2.7 km (95% CI: 0.2; 5.2) in 2016. The municipalities in the "Never had" category had a mean change of 1.7 km from 2008 to 2016 (95% CI: -0.1; 3.5), and the "Always had" group experienced a mean change in distance travelled by -1.6 km (95% CI: -4.2; 1.0) (Table 2). Municipalities in the "Had in 2008" category increased the distance travelled by 10.2 km (95% CI: 4.5; 15.9). Stratified subgroup analyses for contacts during nighttime, AMI contacts, and aortic aneurysm contacts showed similar results where the "Had in 2008" group had the highest increase in distance travelled (Table 2) compared with the two other groups of municipalities. Changes in distance travelled at the municipality level are illustrated in Figure 1a.

Utilization

Overall, the number of contacts decreased from 234 (95% CI: 225; 243) per 1000 population in 2008 to 220 (95% CI: 210; 231) in 2016. The use of emergency hospital care decreased in all three groups of municipalities. The "Always had" group had 242 (95% CI: 226; 257) contacts per 1000 population. This group also experienced the largest change, with 18.5 fewer (95% CI: -28.6; -8.3) contacts per 1000 population. The "Never Had" municipalities reduced their utilization by 5.0 (95% CI: -12.6; 2.1) contacts per 1000 population, and the "Had in 2008" municipalities reduced their use by 14.5 (95% CI: -25.0; -3.9).

The analyses that include contacts during the nighttime experienced a general low reduction in utilization of acute hospital care from 2008 to 2016. Only the "Always had" group experienced a significant reduction in utilization (change: -2.6, 95% CI: -4.3; -0.8). A decline in utilization was also present for AMI and aortic aneurysm contacts. The reductions for AMI contacts were homogeneous across municipality groups. However, for aortic aneurysm contacts, the utilization level was not lowered for the "Always had" group from 2008 to

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Table 1. Baseline characteristics of the contacts in the three subgroups: (1) never had an emergency department in their municipality, (2) had a closure of access to emergency-care services or a downgrading to an injury clinic between 2008 and 2016 within their municipality, and (3) always had an emergency department in their municipality

Municipalities	2008			2016		
	Never Had n = 164,946	Had in 2008 n = 200,993	Always Had n = 324,807	Never Had n = 171,052	Had in 2008 n = 199,465	Always Had n = 322,312
Sex						
Female	46.6 %	46.9 %	47.3 %	48.2 %	48.2 %	49.2 %
Male	53.4 %	53.1 %	52.7 %	51.8 %	51.8 %	50.8 %
Age Group (years)						
18-29	15.7 %	17.8 %	20.9 %	13.9 %	15.5 %	18.6 %
30-39	13.1 %	12.5 %	13.8 %	9.5 %	9.7 %	10.5 %
40-49	14.4 %	14.2 %	13.8 %	12.5 %	12.2 %	12.2 %
50-59	14.3 %	13.7 %	13.4 %	14.5 %	14.1 %	13.9 %
60-69	15.7 %	14.7 %	13.6 %	16.1 %	15.6 %	14.6 %
70-79	13.8 %	13.6 %	12 %	17.8 %	17.2 %	16 %
80-89	10.6 %	10.9 %	10 %	12.3 %	12.5 %	11.1 %
90+	2.5 %	2.5 %	2.4 %	3.4 %	3.4 %	3.3 %
Charlson 1987						
Low 0	58.6 %	59.8 %	61.4 %	53.5 %	53.9 %	56.1 %
Medium 1-2	27.6 %	26.6 %	25.5 %	29.3 %	29 %	27.9 %
High >2	13.8 %	13.6 %	13 %	17.1 %	17.1 %	16.1 %
Educational level						
Low	0.1 %	0.2 %	0.3 %	0.1 %	0.2 %	0.3 %
Medium	80.8 %	80.2 %	78.2 %	81.2 %	80.7 %	77.7 %
High	12.9 %	13.1 %	14.9 %	15.4 %	15.7 %	18.2 %
Missing	6.2 %	6.5 %	6.6 %	3.3 %	3.4 %	3.8 %
Income						
Euro (sd)	30.9 (28.2)	30.6 (26.3)	30.3 (26.2)	34.4 (26.1)	33.9 (25.1)	34.1 (38.6)
Ethnicity						
Foreign	4.1 %	5.5 %	7.4 %	5.8 %	6.8 %	9.1 %
Danish	95.9 %	94.5 %	92.6 %	94.2 %	93.2 %	90.9 %
Civil Status						
Single	51.5 %	54.5 %	58.7 %	53.5 %	56.4 %	59.7 %
Partnered	48.5 %	45.5 %	41.3 %	46.5 %	43.6 %	40.3 %
Time of day						
07:00 – 15:00	50.4 %	50.6 %	49.1 %	49.9 %	49.9 %	50.1 %
15:00 – 23:00	38.3 %	38.4 %	38.6 %	38.7 %	38.9 %	37.9 %
23:00 – 07:00	11.3 %	10.9 %	12.3 %	11.3 %	11.2 %	12 %

Sd: standard deviation

2016. Changes in the utilization at the municipality level are illustrated in Figure 1b.

Mortality

In 2008, for every 1000 contacts, 17.1 (95% CI: 16.5; 17.6) patients died within the hospitals. The age-standardized in-hospital mortality rate was reduced by 4.4 per 1000 contacts (95% CI: -5.1; -3.7). All three

municipality groups experienced similar reductions. The age-standardized in-hospital mortality rate among contacts during nighttime developed the same way as the main cohort, with a generally lower mortality rate in 2016 than in 2008. Again, there were similar reductions for the three municipality groups. The mortality rate was also lowered from 2008 to 2016 for AMI contacts. The “Had in 2008” group did

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Table 2. Data on distance travel, utilization and in-hospital mortality for 2008, 2016 and changes

	2008			2016			Change			
	Coef	95% CI		Coef	95% CI		Coef	95% CI		P-value
All contacts										
Distance, km										
Total	17.0	13.9	20.1	19.7	15.9	23.5	2.7	0.2	5.2	0.038
Never had	24.9	22.8	26.9	26.6	24.2	29.2	1.7	-0.1	3.5	0.060
Had in 2008	22.1	16.9	27.2	32.3	27.8	36.8	10.2	4.5	15.9	<0.001
Always had	9.8	6.8	12.7	8.2	6.6	9.7	-1.6	-4.2	1.0	0.23
Contacts*, per 1000 population										
Total	234	225	243	220	210	231	-13.8	-20.3	-7.3	<0.001
Never had	216	203	230	211	197	225	-5.0	-12.6	2.1	0.156
Had in 2008	238	223	254	223	209	241	-14.5	-25	-3.9	0.01
Always had	242	226	257	224	205	241	-18.5	-28.6	-8.3	<0.001
Mortality*, per 1000 contacts										
Total	17.1	16.5	17.6	12.7	11.9	13.4	-4.4	-5.1	-3.7	<0.001
Never had	17.8	16.7	18.8	13.1	11.7	14.5	-4.6	-6.2	-3.1	<0.001
Had in 2008	17.4	16.1	18.8	12.9	11.5	14.2	-4.5	-5.9	-3.2	<0.001
Always had	16.6	15.9	17.1	12.3	11.2	13.5	-4.2	-5.2	-3.2	<0.001
Nighttime (23:00-07:00)										
Distance, km										
Total	16.6	13.4	19.9	19.8	15.6	24.0	3.2	0.4	5.9	0.023
Never had	24.8	22.8	26.8	27.4	24.5	30.1	2.6	0.2	4.8	0.027
Had in 2008	22.9	17.2	28.5	34.6	30.7	38.6	11.8	5.7	17.8	<0.001
Always had	9.3	6.3	12.3	7.6	6.1	9.1	-1.7	-4.5	1.0	0.190
Contacts*, per 1000 population										
Total	27.6	26.2	28.9	25.9	24.4	27.3	-1.7	-2.8	-0.6	0.002
Never had	25.0	23.4	26.5	24.3	22.7	25.9	-0.7	-1.8	0.3	0.152
Had in 2008	26.8	24.2	29.3	25.5	23.6	27.3	-1.3	-3.1	0.5	0.161
Always had	29.5	27.3	31.8	27	24.1	29.9	-2.6	-4.3	-0.8	<0.001
Mortality*, per 1000 contacts										
Total	23.3	21.9	24.8	15.9	14.8	17.0	-7.5	-8.6	-6.3	<0.001
Never had	24.3	21.7	26.9	16.4	13.4	19.4	-7.9	-11.5	-4.2	<0.001
Had in 2008	23.9	22.3	28.1	16.3	15.0	18.3	-7.6	-10.5	-4.7	<0.001

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not experience a statistically significant reduction in the age-standardized mortality rate (change: 3.1, CI 95% -11.5; 17.7). No statistically significant changes in the age-standardized mortality rate were found in the analyses of aortic aneurysm contacts. Changes in mortality at the municipality level are illustrated in Figure 1c.

Discussion

Statement of principal findings

The number of acute hospital care entry points was approximately halved from 2008 to 2016.^{4,5} During

that period, the residents travelled on average 2.7 km farther for acute hospital care. Of the 69 municipalities, 19 had an acute hospital closure; patients in these municipalities travelled 11 km farther for acute care in 2016 than in 2008. This pattern remains for contacts restricted to nighttime and contacts diagnosed with AMI or aortic aneurysm. Overall, changes in the utility of acute hospital care did not depend markedly on whether a municipality had closed an emergency hospital. No clear pattern was found between distance travelled and utilization changes. The in-hospital mortality declined overall and for the subgroups analyzed. However, the decline in in-hospital mortality

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Always had	22.7	20.4	24.2	15.5	14.0	16.8	-7.2	-8.3	-6.1	<0.001
AMI-contacts										
Distance, km										
Total	18.0	15.2	20.9	25.0	20.8	29.1	6.9	3.9	9.9	<0.001
Never had	25.6	23.4	27.9	30.1	26.9	33.3	441	1.9	7.0	<0.001
Had in 2008	21.5	16.8	26.2	38.5	34.0	43.0	17.1	12.5	21.7	<0.001
Always had	10.9	7.7	14.2	11.4	8.9	13.9	0.4	-2.6	3.5	0.780
Contacts*, per 1000 population										
Total	2.5	2.4	2.7	1.9	1.7	2.1	-0.6	-0.8	-0.5	<0.001
Never had	2.5	2.2	2.7	2.0	1.8	2.2	-0.5	-0.8	-0.2	<0.001
Had in 2008	2.7	2.4	2.9	2.1	1.9	2.3	-0.6	-0.9	-0.3	<0.001
Always had	2.4	2.2	2.7	1.7	1.3	2.0	-0.8	-1.0	-0.5	<0.001
Mortality*, per 1000 contacts										
Total	45.6	39.2	52.5	33.4	26.1	40.7	-12.2	-21.8	-2.9	0.010
Never had	47.0	35.4	58.5	29.9	22.9	37.0	-17.0	-30.5	-3.5	0.010
Had in 2008	43.7	33.3	54.2	46.8	35.1	58.5	3.1	-11.5	17.7	0.660
Always had	45.5	36.2	54.9	27.8	14.7	40.9	-17.7	-32.1	-3.5	0.017
Aorta aneurysm contacts										
Distance, km										
Total	20.5	18.2	22.8	21.7	17.6	25.0	1.2	-2.1	4.4	0.482
Never had	25.0	21.6	28.4	28.6	25.2	32.0	3.6	-0.5	7.6	0.075
Had in 2008	22.2	18.9	25.6	33.2	27.5	38.9	11.0	4.8	17.1	0.002
Always had	15.1	11.6	18.5	11.9	9.5	14.4	-3.1	-7.3	1.0	0.140
Contacts*, per 100,000 population										
Total	9.5	8.5	10.5	8.3	7.5	9.1	-1.2	-2.6	0.2	0.081
Never had	10.7	8.9	12.5	6.7	5.3	8.1	-4.0	-5.9	-2.2	<0.001
Had in 2008	11.4	9.6	13.3	8.1	6.9	9.3	-3.3	-5.5	-1.1	0.002
Always had	7.7	6.6	9.9	9.1	7.9	10.3	1.4	-0.3	3.1	0.120
Mortality*, per 1000 contacts										
Total	150	128	172	124	104	145	-26.1	-56.4	4.3	0.091
Never had	131	103	160	102	62	142	-29.2	-80.6	22.2	0.271
Had in 2008	174	134	213	133	93	172	-43.1	-105	18.6	0.174
Always had	147	98	196	136	109	167	-10.9	-62.3	40.5	0.681

* Age Standardized to 2008 Denmark population

did not apply to AMI contacts living in the 19 municipalities that had had an acute hospital closure and those contacts experienced the most significant increase in distance travelled to emergency care.

Limitations and strengths

Our study has several limitations. It would have been preferable to link distance, utilization, and mortality at a patient level, at which comprehensive adjustment is possible; however, we believe that age-standardized analyses are sufficient to detect within-municipality changes. Further, it is a limitation that we have used the home address as a starting point for estimating the distance travelled instead of the address where the emergency occurred, which could

have contributed to more precise estimates. However, the sensitivity analyses for night hospitalizations did not give rise to other conclusions. The inclusion of all patients with acute hospital contact and the high-quality registries are the strengths of this study. The values for distance travelled are calculated for this study and include some missing data, which is a limitation. However, missing data are unavoidable in epidemiological research.¹⁹ The missing values were related to some particular municipalities and would probably bias model estimates more than the multiple imputation procedures we used to replace them.¹⁹ Finally, this is a descriptive study, and no causalities can be drawn. Co-occurrences in changes in distance, utilization, and mortalities are a weak

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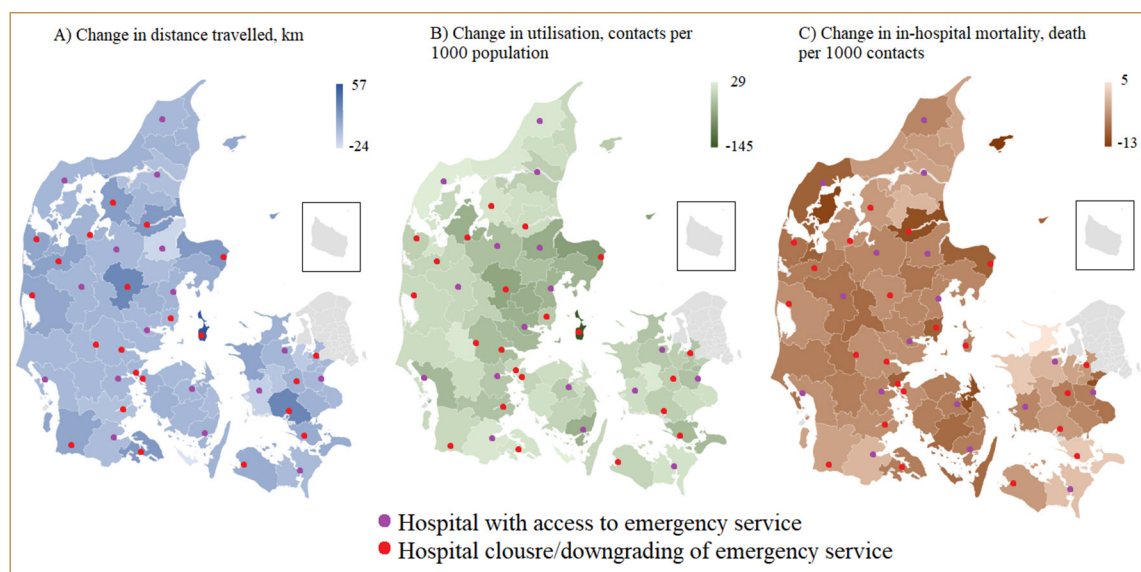


Figure 1. Local area changes for Danish municipalities from 2008 to 2016. The grey areas are the Capital Region, which is excluded from the study

association and should be used only for hypothesis-generating causal chains.

Interpretation within the context of the wider literature

In contrast to this study's results, previous international studies have shown an increasing trend in emergency department contacts seeking health care in several countries.²⁰⁻²² However, this does not seem the case in Denmark.¹⁰ The reduction in utilization in Denmark has previously been linked to the implementation of mandatory referral, which served as a barrier for contacts with "injuries and poisoning" and "other factors influencing health status and contact with health services".¹²

In terms of the effect of increased distance travelled to emergency departments seen in this study, previous studies have shown that increased distance to emergency departments is not associated with increased mortality in the general population requiring emergency care.^{23,24} The only exceptions were acute myocardial infarcts and trauma, for which the risk of mortality increased for both groups in the first few years after reorganization.^{23,24} Fløjstrup et al. have documented a downward trend in the in-hospital mortality in Denmark, which is consistent with this study's results. Our study's results show a consistent reduction in in-hospital mortality across municipality groups, suggesting that if the reconfiguration has affected mortality, this has occurred uniformly across municipalities, irrespective of emergency hospital status. Like other studies,^{8,23,24} our results suggest that AMI contacts in municipalities with increased distance to emergency departments have not experienced

the improved mortality documented for other contacts—suggesting that residents living the farthest away from an acute hospital do not achieve the improvement effects that closer residents benefit from. Patient trajectories are very complex, and our study does not point to whether a problem might be present for AMI contacts. Analyses adjusted for patient characteristics are needed before a clear conclusion can be drawn on the cause of this reported difference.

Implications for policy, practice, and research

Because of its descriptive nature, this study's implications are limited. Many healthcare settings are changing, and hospital closure is often seen as a means to secure higher volume and more specialized care. After a period of centralization in Denmark, the political mood is pointing once more to decentralizing, mainly for outpatients. We hope that these results can contribute to clarity on how hospital closures may affect the utilization of emergency services for residents in the immediate area. The reason for the between-group differences cannot be drawn based on this study.

Conclusion

Our results show that emergency contacts travel farther following the centralization of emergency services, especially citizens in municipalities that have lost emergency services. This study's results do not indicate that hospital closures, and thereby increased distance, have contributed significantly to barriers to access to emergency care. In-hospital mortality declined for all except AMI contacts in municipalities that have lost emergency services.

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Contributorship

All authors contributed substantially to the work's conception or design; or the acquisition, analysis, or interpretation of data. Specifically, SBB and JH conceived the study, and SBB, JH, and MF processed and analyzed the data. SBB, MBr, and MB designed the statistical analysis plan. All authors were involved in the design and interpretation of the data. SBB and LM drafted the paper, and all authors revised it critically and gave the final approval for publication.

Ethics

Danish law does not require informed consent from patients for registry-based studies.¹⁵

Funding

This work was supported by the Region of Southern Denmark (17/33854).

Conflict of interests

No known conflict of interests

Data availability statement

According to Danish law, data cannot be shared. However, data can be obtained from a third party but are not publicly available. The data sources are available for other researchers pending approval from Statistics Denmark.

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