

**Effects of Economic and Socio-Structural Characteristics of the Living Area on the Risk of Long-Term Care in Germany with a Special Focus on Cardiovascular Diseases.
A Study Based on Health Claims Data in 2014-2016**

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Abstract

This study aims to investigate the role of economic and socio-structural characteristics of the living region on the incidence of severe disability, and whether there is an interplay with selected severe cardiovascular diseases.

We analysed quarterly recorded health claims about in- and out-patient diagnoses and basic demographic data of 250,000 randomly sampled members of the largest German health insurance, the AOK, at age 50+. Combined with administrative indicators of economic performance and medical infrastructure, competing risk regression adjusting for mortality were performed to identify the risk factors of general and severe long-term care.

The analyses revealed a disability advantage of persons in very wealthy compared to persons in very poor regions in the risk of general long-term care need (10% lower risk, $p < 0.001$). In case of severe long-term care need, there was an advantage of persons in highly urbanised regions compared to persons in rural areas (14% lower risk, $p < 0.001$). These gradients were stable after adjusting for cardiovascular diseases. Almost all selected cardiovascular diseases were significantly associated with a higher risk of long-term care.

The incidence of general long-term care may be highly sensitive to direct financial or indirect opportunity costs – represented by the wealth indicator - of the caring partners and relatives (material and decisional approach). The structure of (acute) medical and care facilities of a region – indicated by population density - may be an indicator for the potential resources to avoid severe long-term care need or for the attraction of persons with specific health-related characteristics.

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Extended abstract

Background: Demographic and health trends over the last decades resulted in marked changes of the compositions of the populations of the welfare states. These trends further varied between the regions within the nations. Germany is one of the forerunners in demographic ageing and has one of the worlds-oldest public health care systems, based on the principle of egalitarianism. These facts make Germany to an excellent case example. Earlier studies using aggregated data showed profound regional disparities in the prevalence of long-term care in Germany, as well as clear linkages to macrostructural characteristics of the living area like economic performance and urbanity. The results indicated growing socioeconomic and rural-urban inequalities in severe morbidity within a welfare state with an egalitarian health policy. Up to now, there are only few studies based on population-based, representative and large-scale longitudinal microdata with objective health measures. There is also a lack of studies investigating the association of cardiovascular diseases or events, and regional inequalities in long-term care. Cardiovascular diseases are the main cause of death and a high-risk factor of severe disability. This study aims to investigate the role of economic and socio-structural characteristics of the living region on the incidence of severe disability of the individuals, and whether there is an interplay with selected severe cardiovascular diseases.

Data and methods: We analysed quarterly recorded health claims about in- and out-patient diagnoses and basic demographic data of 250,000 randomly sampled members of the largest German health insurance, the AOK, at age 50+. Included in the dataset are also information about the 5-digit postcode-region, the legally recognised status of care need, and – if applicable - the date of death. The first observation of the cohort of patients is the first quarter in 2014, and all data is regularly and officially collected until the last quarter in 2016. The health claims were combined with administrative data about the available income of the private households per head in a region, and the population density of a region. Both indicators of economic performance and of physical, social and infrastructure were collected by the German national statistical office.

We used competing risk-regression models, which allows to estimate the effects of the individual and macro-level risk factors by considering death as a major competing risk of long-term care. All models were controlled for changes of the living area (removals), which could be directly related to entry into long-term care. We distinguished between long-term care need in general and severe long-term care need. Thus, we excluded all persons with (severe) long-term care in the first quarter of 2014. All calculations were performed by Stata 13.

Results: In the sample population, 14,941 persons out of 216,844 patients showed a new demand for long-term care in general, while 6,961 persons died before long-term care was needed. In case of severe long-term care need, 9,143 persons out of 231,570 patients were newly classified as severely limited, while 11,501 persons died within the time-to-risk.

The regression models revealed some strong risk factors of long-term care need, even regarding mortality as the major competing risk. As expected, there was a very large age effect of long-term care, with a very steep increase at the highest ages. Females showed a 7% higher risk of any long-term care, while there was no sex difference in severe long-term care risk. Almost all selected cardiovascular diseases were significantly associated with a higher risk of long-term care. One of the highest risks of general and severe long-term care need was revealed for heart insufficiency with an 80% (general) and 65% (severe) increased risk, hypertension with an 56% (general) and 47% (severe) risk, and acute myocardial infarction with an about 38% increased risk. In case of the risk factors of the living region, we found different results for general and severe long-term care need. In case of general care need, there was a significantly 10% lower risk for persons living in the wealthiest regions compared to the risk of persons living in the poorest regions. The tendency was the same for severe long-term care, but the effects were not statistically significant. In contrast, persons living in the most densely inhabited regions had a significantly 14% lower risk of severe long-term care, while there was no effect of population density on the risk of general long-term care. The effects of the regional characteristics remained stable also after adjusting for cardiovascular diseases.

Discussion: The large-scale database enabled us to investigate contextual effects on the incidence of long-term care need of the individuals by adjusting for the composition of the patient population, individual changes of the context (removals), and the patients' health biography. We detected diverse spatial health disparities: The analyses revealed a gradient between persons in very wealthy and in very poor regions in the risk of general long-term care need. This gradient was stable after adjusting for a wide range of cardiovascular diseases. In case of severe long-term care need, there was a disparity between persons in highly urbanised regions compared to persons in rural areas, with a disability advantage for persons in metropolitan areas. Cardiovascular diseases were identified as severe risk factors of long-term care need, but they did not completely explain the spatial disparities. The different effects of population density and wealth on general and on severe long-term care need indicated differences in the causal pathways and in the selection processes: The incidence of general long-term care may be highly sensitive to direct financial or indirect opportunity costs of the caring partners and relatives (material and decisional approach). Thus, the income of the private households was the major driver for general long-term care.

The incidence of severe long-term care may be affected by selection due to health-related migration and mortality (health services and epidemiological approach). Population density, which is associated with the structure of (acute) medical and care facilities of a region, may be an indicator for the potential resources to avoid severe long-term care need or for the attraction of persons with specific health-related characteristics. This selection effect led to a lower risk in the metropolitan areas.