Association between the German Index of Multiple Deprivation and mammography screening participation rates: an ecological study

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Background

A Population-based mammography screening program (MSP) was implemented 2005-2009 in Germany[1]. Females aged 50 to 69 years are actively invited to biennial screening examinations. The overall participation rate (PR) ranges between 50% and 55%. Area-based measurements of socioeconomic factors have been used to assess and explain regional variations in early detection programs[2,3,4,5]. The objective of this study was to investigate the association between the German index of multiple deprivation (GIMD 2010)[5] and MSP-PR at the level of municipalities in Lower Saxony.

Methods

Data on MSP participation for females aged 50-69 years and the corresponding population was retrieved from the epidemiological cancer registry of Lower Saxony for the period from 2013-2022. A total of 403 municipalities were assigned deprivation quintiles (GIMD-Q), where GIMD-Q1 referred to the least deprived area and GIMD-Q5 to the most deprived area. The GIMD-Q was linked to the screening data set using the municipality information of the place of residence at the time of screening of the participants. MSP-PR were calculated overall, for each of the 403 municipalities according to GIMD-Q and for the five 4-year-age groups (50-53, 54-57, 58-61, 62-65, 66-69 years) during the period 2013-2022. A mixed quasipoisson regression analysis was used to assess the association between GIMD-Q and MSP-PR while adjusting for age groups. Participation rate ratios (PRR) were estimated for GIMD-Q and age groups by fitting the regression model, which included fixed effects for GIMD-Q, age group, an offset for the logarithm of mean population size, a random intercept for each municipality and a random slope for each age group within the municipality. All statistical analyses were conducted in R version 4.4.2.

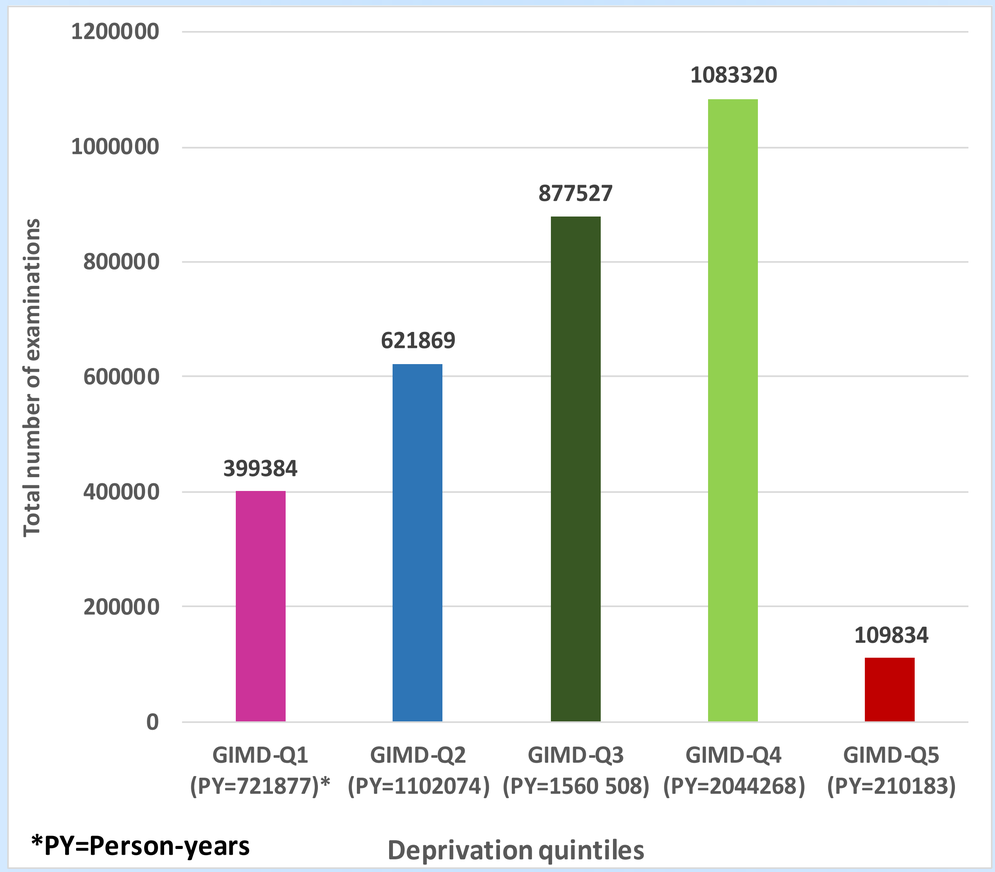

Figure 1: Mammography screening program participations for deprivation quintiles, period 2013-2022

Deprivation Quintiles	Age groups (Years)					
	50-53	54-57	58-61	62-65	66-69	50-69
GIMD-Q1	56.4	55.2	55.5	55.2	53.7	**55.3**
GIMD-Q2	57.2	56.7	56.8	56.7	54.9	**56.4**
GIMD-Q3	56.6	56.9	56.6	56.3	54.4	**56.2**
GIMD-Q4	53.6	53.5	53.3	53.0	51.1	**53.0**
GIMD-Q5	52.2	52.6	52.7	52.5	51.0	**52.3**
Overall	**55.4**	**55.3**	**55.1**	**54.9**	**53.0**	**54.8**

Table 1: Mammography screening program participation rates (%) for deprivation quintiles stratified by age groups in Lower Saxony, period 2013–2022

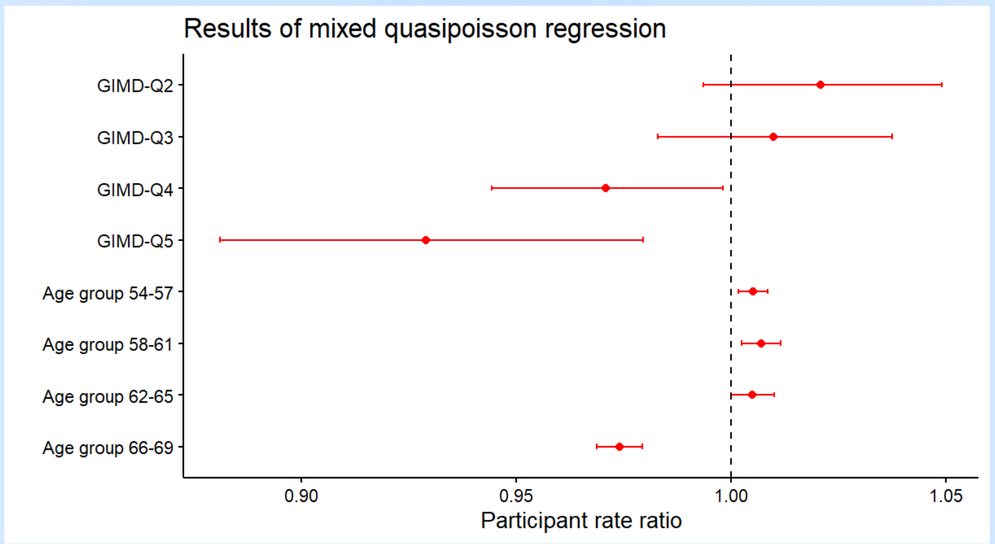

Figure 2: Participation rate ratios for deprivation quintles and age groups, with GIMD-Q1 and age group 50-53 years as references, respectively

Results

A total of 3,091,934 screening examinations were done with an overall MSP-PR of 54.8% for the entire screening period 2013-2022. Overall, the highest MSP-PR were observed in GIMD-Q2: 56.4% and GIMD-Q3: 56.2%. A slight gradient in MSP-PR was observed by age groups, ranging from 55.4% in the youngest age group to 53.0% in the oldest, see table 1. After adjusting for age groups, the PRR for GIMD-Q4 was 0.971 (95%-CI: 0.944-0.998, p=0.04), showing that the PR was 2.9% lower compared to GIMD-Q1. For GIMD-Q5, the PRR was 0.929 (95%-CI: 0.881-0.979, p<0.01), indicating that the PR was 7.1% lower compared to GIMD-Q1. The PRR for the age groups 54-57 years and 58-61 years were 1.005 (95%-CI: 1.002-1.008, p=0.003) and 1.007 (95%-CI: 1.002-1.011, p=0.003), showing that the PR were 0.5% and 0.7% slightly higher compared to the youngest age group 50-53 years. The PRR for the oldest age group 66-69 years was 0.974 (95%-CI: 0.969-0.979, p<0.001), showing that the PR was 2.6% lower compared to females in the youngest age group 50-53 years after adjusting for regional deprivation.

Discussion

These results demonstrate that females living in the most socioeconomically deprived areas and females in the oldest age group in Lower Saxony are less likely to participate in the MSP. They concur with similar studies conducted in Germany and internationally[2,3,6]. Because this was an ecological study, the results should be interpreted with caution. The extent to which individual socioeconomic status, lifestyle factors, psychological factors, other health related factors and quality of life are associated with MSP-PR should be further investigated.

Literature:
[1]Malek D, Kääb-Sanyal V. Implementation of the German Mammography Screening Program (German MSP) and First Results for Initial Examinations, 2005-2009. Breast Care (Basel). 2016 Jun;11(3):183-7. doi: 10.1159/000446359.
[2]Czwikla J, Urbschat I, Kieschke J, Schüssler F, Langner I, Hoffmann F. Assessing and Explaining Geographic Variations in Mammography Screening Participation and Breast Cancer Incidence. Front Oncol. 2019 Sep 18;9:909. doi: 10.3389/fonc.2019.00909
[3]Lemke, D., Berkemeyer, S., Mattauch, V. et al. Small-area spatio-temporal analyses of participation rates in the mammography screening program in the city of Dortmund (NW Germany). BMC Public Health 15, 1190 (2015).doi.10.1186/s12889-015-2520-9
[4]Maier W. [Indices of Multiple Deprivation for the analysis of regional health disparities in Germany : Experiences from epidemiology and healthcare research]. Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz 2017;60(12):1403-1412.
[5]Maier W, Fairburn J, Mielck A. [Regional deprivation and mortality in Bavaria. Development of a community-based index of multiple deprivation]. Gesundheitswesen 2012;74(7):416-25.
[6] Jack RH, Robson T, Davies EA. The varying influence of socioeconomic deprivation on breast cancer screening uptake in London. J Public Health (Oxf). 2016 Jun;38(2):330-4. doi: 10.1093.

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