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# Attendance in BreastScreen Norway among immigrant and Norwegian-born women

ORIGINAL ARTICLE

SAMEER BHARGAVA

E-mail: sambha@vestreviken.no
Cancer Unit
Medical Department
Bærum Hospital, Vestre Viken
and
Cancer Registry of Norway
Sameer Bhargava, PhD and senior consultant. As a PhD candidate he was employed at the Cancer Registry of Norway where he now holds a post-doc position, and where he took his PhD degree in BreastScreen Norway.
The author has completed the ICMJE form and declares no conflicts of interest.

GUNHILD MANGERUD

Section for Breast Cancer Screening
Cancer Registry of Norway
Gunhild Mangerud, Master of Public Health and advisor in BreastScreen Norway.
The author has completed the ICMJE form and declares no conflicts of interest.

SOLVEIG HOFVIND

Section for Breast Cancer Screening
Cancer Registry of Norway
and
Department of Life Sciences and Health
Oslo Metropolitan University
Solveig Hofvind, PhD, head of BreastScreen Norway and professor of radiography.
The author has completed the ICMJE form and declares no conflicts of interest

BACKGROUND

Women residing in Oslo have had lower attendance in BreastScreen Norway than the national average. We explored attendance in BreastScreen Norway among immigrant versus Norwegian-born women in Oslo, compared to other counties in Norway.

MATERIAL AND METHOD

We linked attendance data from BreastScreen Norway to sociodemographic data from Statistics Norway for 885 979 women offered mammographic screening in the period 1996–2015. We undertook descriptive analyses of attendance in the different counties for the group of invitees as a whole, and for Norwegian-born and immigrants by country of birth ('Western Europe, Northern America, Australia and New Zealand' and 'other countries'). Furthermore, we estimated the predicted likelihood of attendance with the aid of logistic regression, using attendance (yes/no) as the outcome variable. Independent variables in the model included place of residence (Oslo/other counties), country of birth and interaction between these variables. In addition, we adjusted for age at the time of the invitation, education and marital status.

RESULTS

Among women residing in Oslo, attendance was 67 % among Norwegian-born women, 61 % among women born in Western Europe, Northern America, Australia and New Zealand, and 39 % among women born in 'other countries'. Among women residing outside Oslo, the corresponding attendance was 79 %, 71 % and 50 % respectively.

INTERPRETATION

Oslo as place of residence was associated with lower attendance in BreastScreen Norway, especially among immigrant women from 'other countries', and independently of adjustment for possible confounding variables.

## MAIN FINDINGS

Attendance in BreastScreen Norway was lower in Oslo than in the other counties, both among immigrants and Norwegian-born women.

Oslo as a place of residence was most strongly associated with low attendance among women born in countries outside Western Europe, Northern America, Australia and New Zealand.

Breast cancer is the most common type of cancer among women and one of the most frequent causes of cancer deaths in Norway (1). Mammographic screening is a secondary preventive healthcare measure, the objective of which is to reduce breast cancer mortality through detection and treatment of the disease at an early stage. European guidelines for quality assurance of breast cancer screening and diagnostics include process indicators that are used to assess whether the performance of a screening programme is of sufficient quality to potentially achieve a reduction of breast cancer mortality in the target group, and 70 % has been defined as an acceptable level for the indicator *attendance* (2).

The Cancer Registry of Norway has been commissioned by the Ministry of Health and Care Services to administer BreastScreen Norway. Through this programme, all women in Norway in the age group 50–69 years, irrespective of country of birth, are offered mammographic screening every two years. If required, supplementary examinations, diagnostics and treatment are undertaken in one of the country's 16 breast diagnostic centres (17 centres since 1 January 2020). The attendance among the women invited has amounted to approximately 75 % since the start of the programme in 1996, but has varied from 62 % in Oslo to 82 % in the county of Sogn og Fjordane (3). The proportion of immigrant women who have attended BreastScreen Norway has remained considerably lower than the proportion of Norwegian-born women (4). Similar results can be found in studies from other countries on attendance for mammographic screening in urban versus rural areas and among immigrant versus non-immigrant women (5–9).

One-third of the population in Oslo are immigrants or Norwegian-born persons with immigrant parents, and this proportion is twice the national average (10). We do not know whether the attendance in BreastScreen Norway among immigrants varies by county, or whether the high proportion of immigrants in Oslo partially explains the low attendance in Oslo. The objective of this study was to explore attendance in BreastScreen Norway among immigrant and Norwegian-born women in Oslo, compared to the other counties in Norway.

## Material and method

### UNDERLYING DATA

We received information from the Cancer Registry of Norway on invitations to and attendance in BreastScreen Norway for all women in the target group for the period 1996–2015. Information on country of birth, education and marital status was retrieved from Statistics Norway. Data from the Cancer Registry of Norway were linked to data from Statistics Norway at the individual level. The study was approved by the Regional Committee for Medical and Health Research Ethics (2013/795). We have previously investigated attendance rates by country of birth (4) and sociodemographic factors (11), as well as screening parameters and tumour characteristics among women who attend mammographic screening (12), using the same study population as in this study.

### DEFINITIONS

We refer to the areas covered by the 16 breast diagnostic centres as 'county areas'. Each centre has a catchment area that largely follows the county boundaries from before 2020, with the exception of Trøndelag (North and South Trøndelag), Agder (East and West Agder), Troms og Finnmark (Troms and Finnmark), Vestre Viken (Buskerud and Asker and Bærum municipalities) and Akershus (Romerike and Follo regions) (13).

We used Statistics Norway's definition of immigrants: persons born abroad with two foreign-born parents and four foreign-born grandparents (14). Furthermore, we divided the immigrant women into two groups according to their country of birth: immigrants born in Western Europe, Northern America, Australia and New Zealand, and immigrants born in 'other countries' (see Appendix 1). Our grouping corresponds to the frequently used, but imprecise division of 'western' and 'non-western' countries, and was chosen because various sociodemographic factors such as income, education and occupational status, as well as pre- and post-migratory conditions vary between the said groups at the group level. Moreover, the prevalence of breast cancer varies geographically – women in so-called non-western countries have a lower prevalence of breast cancer than other women, and this could potentially affect awareness of breast cancer and attendance for screening for immigrants from these countries (15).

Education was defined as the highest level of education registered for each individual woman until 2015, and categorised as primary/lower secondary, upper secondary, university college/university up to four years, university college/university more than four years, and none/not stated. Marital status was defined as married/partner, widowed, divorced or unmarried. Age was categorised into the following groups: < 55 years, 55–59 years, 60–64 years and > 64 years. Attendance was defined as participation in BreastScreen Norway in response to an invitation, with a reminder if relevant.

### STATISTICAL ANALYSES

We undertook descriptive analyses of the attendance for immigrant and Norwegian-born women residing in various county areas, and of the proportion of invitations sent to immigrant women among all invitations sent. Logistic regression was used to analyse the odds of attending a screening examination. Repeated attendance was addressed by specifying the correlation structure to permit dependency between women. Model 1

included country of birth, place of residence (Oslo/other county areas), and interaction between these variables. Model 2 also included adjustment for age, education and marital status. We used STATA/MP 14.1 for all the analyses.

## Results

During the study period, the Cancer Registry of Norway sent 513 641 invitations to 106 795 women residing in Oslo, and 3 540 050 invitations to 779 184 women in the other county areas (Table 1). The proportion of immigrant women was 17 % (18 639/106 795) in Oslo and 7 % (53 568/779 184) in the rest of the country.

**Table 1**

Number of women invited to BreastScreen Norway, number of invitations and the number of invitations sent to immigrant women in the period 1996–2015 in 16 county areas.

| **County area** | Invited women, ***n*** (% of all invitees) | Invitations sent, ***n*** (% of all invitations) | **Proportion of invitations sent to immigrants from … (%)** | | |
|---|---|---|---|---|---|
| | | | **All countries** | **Western Europe, Northern America, Australia and New Zealand** | **'Other countries'** |
| Oslo | 106 795 (12) | 513 641 (13) | 15 | 5 | 11 |
| Østfold | 50 315 (6) | 220 079 (5) | 7 | 3 | 4 |
| Akershus | 94 307 (11) | 435 686 (11) | 8 | 4 | 4 |
| Hedmark | 35 142 (4) | 144 328 (4) | 5 | 2 | 2 |
| Oppland | 35 027 (4) | 151 843 (4) | 4 | 2 | 2 |
| Vestfold | 40 591 (5) | 157 591 (4) | 6 | 3 | 3 |
| Telemark | 33 650 (4) | 158 753 (4) | 5 | 2 | 3 |
| Agder | 49 543 (6) | 227 352 (6) | 6 | 3 | 3 |
| Rogaland | 76 332 (9) | 373 689 (9) | 6 | 3 | 3 |
| Hordaland | 86 561 (10) | 433 111 (11) | 4 | 2 | 3 |
| Sogn og Fjordane | 18 280 (2) | 75 223 (2) | 4 | 2 | 2 |
| Møre og Romsdal | 42 805 (5) | 173 738 (4) | 4 | 1 | 2 |
| Trøndelag | 73 595 (8) | 321 633 (8) | 4 | 2 | 2 |
| Nordland | 43 130 (5) | 183 482 (5) | 3 | 2 | 2 |
| Troms og Finnmark | 42 064 (5) | 193 110 (5) | 5 | 3 | 2 |
| Vestre Viken | 57 842 (7) | 290 432 (7) | 8 | 4 | 5 |

| County area | Invited women, ***n*** (% of all invitees) | Invitations sent, ***n*** (% of all invitations) | Proportion of invitations sent to immigrants from … (%) | | |
|---|---|---|---|---|---|
| | | | All countries | Western Europe, Northern America, Australia and New Zealand | 'Other countries' |
| Total | 885 979 (100.0) | 4 053 691 (100.0) | 7 | 3 | 4 |

Both immigrant and Norwegian-born women had lower attendance in Oslo than in all other county areas (Table 2). Immigrants, especially those born in 'other countries', had lower attendance than Norwegian-born women in all county areas. Among women residing in Oslo, attendance was 67 % among Norwegian-born women, 61 % among women from Western Europe, Northern America, Australia and New Zealand, and 39 % among women from 'other countries'. Among women residing outside Oslo, attendance was 79 % among Norwegian-born women, 71 % among women from Western Europe, Northern America, Australia and New Zealand, and 50 % among women from 'other countries' (Table 3).

**Table 2**

Attendance (%) among all invitations sent to all women, Norwegian-born women and immigrant women in 16 county areas in BreastScreen Norway in the period 1996–2015

| County area | All women | Norwegian-born women | Immigrants from … | | |
|---|---|---|---|---|---|
| | | | All countries | Western Europe, Northern America, Australia and New Zealand | 'Other countries' |
| Oslo | 64 | 67 | 46 | 61 | 39 |
| Østfold | 74 | 76 | 58 | 70 | 48 |
| Akershus | 76 | 77 | 60 | 71 | 49 |
| Hedmark | 71 | 71 | 58 | 65 | 49 |
| Oppland | 74 | 74 | 56 | 67 | 45 |
| Vestfold | 75 | 76 | 59 | 70 | 49 |
| Telemark | 77 | 78 | 59 | 71 | 49 |
| Agder | 80 | 81 | 62 | 74 | 52 |
| Rogaland | 85 | 86 | 62 | 72 | 53 |
| Hordaland | 82 | 83 | 62 | 74 | 53 |
| Sogn og Fjordane | 83 | 84 | 60 | 68 | 53 |

| County area | All women | Norwegian-born women | Immigrants from … | | |
|---|---|---|---|---|---|
| | | | All countries | Western Europe, Northern America, Australia and New Zealand | 'Other countries' |
| Møre og Romsdal | 73 | 74 | 53 | 61 | 48 |
| Trøndelag | 79 | 79 | 57 | 69 | 49 |
| Nordland | 82 | 82 | 62 | 70 | 53 |
| Troms og Finnmark | 81 | 82 | 62 | 71 | 51 |
| Vestre Viken | 76 | 78 | 59 | 71 | 50 |
| Total | 76 | 78 | 56 | 69 | 47 |

**Table 3**

Predicted likelihood (%) and 95 % confidence interval (CI) of attendance for possible combinations of place of residence and country of birth. Model 1 includes place of residence, country of birth and interaction between these. Model 2 also includes age, education and marital status.

| Country of birth | Model 1 | | Model 2 | |
|---|---|---|---|---|
| | Oslo | Other county areas | Oslo | Other county areas |
| Western Europe, Northern America, Australia and New Zealand | 61 (CI 60 to 62) | 71 (CI 70 to 71) | 62 (CI 62 to 64) | 71 (CI 70 to 71) |
| 'Other countries' | 39 (CI 39 to 40) | 50 (CI 50 to 51) | 47 (CI 46 to 47) | 55 (CI 55 to 56) |
| Norwegian-born | 67 (CI 67 to 68) | 79 (CI 79 to 79) | 69 (CI 69 to 69) | 79 (CI 79 to 79) |

Adjusted for age, education and marital status, the predicted likelihood of attendance was 69 % among Norwegian-born women residing in Oslo, 62 % among women from Western Europe, Northern America, Australia and New Zealand residing in Oslo, and 47 % among women born in 'other countries' and residing in Oslo.

Women in the age group 60–64 years, women with up to four years of higher education at university college or university level and married women had higher rates of attendance than other women (see Table 4 in Appendix 2).

## Discussion

Our study showed that immigrants, especially those from 'other countries' (countries outside Western Europe, Northern America, Australia and New Zealand) had lower attendance in BreastScreen Norway than Norwegian-born women in all county areas in the period 1996–2015. Attendance was lower in Oslo than in other county areas for both Norwegian-born women and the two immigrant groups.

These findings are consistent with results from previous studies from BreastScreen Norway (study period 1996–2015) and the CervicalScreen Norway (study period 2008–12), which have also found lower attendance among immigrant women than among Norwegian-born women (4, 16). Sociodemographic factors such as education and marital status have been shown to have an impact on attendance, for immigrant as well as Norwegian-born women (11). Our findings support results from studies from Denmark and Sweden, which have shown lower attendance among women who are unmarried or live alone and have long higher education or have completed only the primary/lower secondary level (5, 6).

The results from this study are important in a public-health perspective. They show that immigrant women, irrespective of country of birth and place of residence, had low attendance for a preventive healthcare measure recommended for women in Norway in the age group 50–69 years, irrespective of their country of birth or place of residence. Women residing in Oslo had low attendance, irrespective of country of birth. This is relevant since Oslo has a higher proportion of immigrants than the other counties, and negative factors related to place of residence may thus affect immigrants to a greater extent than Norwegian-born women.

Groups of immigrants have been shown to have higher prevalence of diabetes, HIV, tuberculosis, physical inactivity, obesity and smoking – diseases and conditions for which prevention and early detection are important (17). GPs play a key role in the management of these diseases and conditions, and studies have shown that some groups of immigrants consult a GP less often than Norwegian-born persons (18). Studies such as this, combined with qualitative studies, may help provide a better understanding of underlying causes of inequality in health-seeking behaviour.

During the ongoing COVID-19 pandemic, inequalities in sociodemographic conditions, communication problems and trust in public authorities have been highlighted as contributory factors of the higher prevalence and worse outcomes of COVID-19 among 'non-Western' immigrant groups compared to other people (19). It is conceivable that the same factors also contribute to the low attendance among immigrants from 'other countries', as described in this study.

We believe that the reasons for these variations in attendance are varied and complex. Variations in health literacy and awareness of breast cancer and screening are potentially relevant. Information on preventive healthcare measures intended for the entire population should be adapted to everyone, including groups that face challenges in terms of health literacy, such as immigrants and persons without higher education, as well as persons with long higher education (20). Public statistics show that Oslo not only has a higher proportion of immigrants, but also of single-person households and persons with long higher education (21, 22). Furthermore, immigrants from 'other countries' are born in countries with a relatively lower prevalence of breast cancer (15). It is therefore conceivable that they regard mammographic screening as less relevant for them than other women do. Combined with more access to private clinics in the capital city of Oslo, these factors may conceivably have contributed to the lower attendance in BreastScreen Norway among women in Oslo than among women in other county areas.

Our methodological choices had some limitations. The broad division of immigrants into two groups did not take into account the major differences in attendance among immigrant women from different countries (4). We only had data that link country of birth to attendance for the years 1996–2015, while the results from BreastScreen Norway in recent years have shown a general increase in attendance. Updated data would be able tell us

whether this increase has occurred among both immigrant and Norwegian-born women. Our county areas were based on the county boundaries that existed until 2020. We believe that an approach using the current county boundaries would not have had a significant effect on the results and objective of this study. Our study is also limited by our lack of access to some factors that may possibly affect attendance, for instance pre-migratory factors, use of private clinics and post-migratory challenges.

## CONCLUSION

Women residing in Oslo had lower attendance in BreastScreen Norway than women in all other county areas, irrespective of whether they were immigrants or not. Having Oslo as the place of residence had a stronger negative effect on attendance among immigrant women born outside Western Europe, Northern America, Australia and New Zealand than among other women.

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*The article has been peer reviewed.*

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