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

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## ORIGINAL ARTICLE

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## **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.

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## **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.

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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.

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## 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, <i>n</i> (% of all invitees)	Invitations sent, <i>n</i> (% 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, <i>n</i> (% of all invitees)	Invitations sent, <i>n</i> (% 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

County area	All women	Norwegian-born women	Immigrants from ...		
			All countries	Western Europe, Northern America, Australia and New Zealand	'Other countries'
Sogn og Fjordane	83	84	60	68	53
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).

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## 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 to 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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## LITERATURE

1. Cancer in Norway 2018 – Cancer incidence, mortality, survival and prevalence in Norway. Oslo: Kreftregisteret, 2019. <https://www.kreftregisteret.no/globalassets/cancer-in-norway/2018/cin2018.pdf> Accessed 17.11.2020.

2. Perry N, Broeders M, de Wolf C et al. European guidelines for quality assurance in breast cancer screening and diagnosis. Fourth edition – summary document. *Ann Oncol* 2008; 19: 614–22.
3. Sebuødegård S, Sagstad S, Hofvind S. Oppmøte i Mammografiprogrammet. *Tidsskr Nor Legeforen* 2016; 136: 1448–51. [PubMed][CrossRef]
4. Bhargava S, Tsuruda K, Moen K et al. Lower attendance rates in immigrant versus non-immigrant women in the Norwegian Breast Cancer Screening Programme. *J Med Screen* 2018; 25: 155–61. [PubMed][CrossRef]
5. Jensen LF, Pedersen AF, Andersen B et al. Identifying specific non-attending groups in breast cancer screening—population-based registry study of participation and socio-demography. *BMC Cancer* 2012; 12: 518. [PubMed][CrossRef]
6. Lagerlund M, Maxwell AE, Bastani R et al. Sociodemographic predictors of non-attendance at invitational mammography screening—a population-based register study (Sweden). *Cancer Causes Control* 2002; 13: 73–82. [PubMed][CrossRef]
7. Screening and immunisations team health and social care information centre. Breast Screening Programme, England. Statistics for 2013–14. London: National Health Service, 2015.
8. Australian Institute of Health and Welfare. BreastScreen Australia monitoring report 2012–2013. Canberra: Australian Institute of Health and Welfare, 2015. <https://www.aihw.gov.au/reports/cancer-screening/breastscreen-australia-monitoring-2012-2013/contents/table-of-contents> Accessed 17.11.2020.
9. Bhargava S, Moen K, Qureshi SA et al. Mammographic screening attendance among immigrant and minority women: a systematic review and meta-analysis. *Acta Radiol* 2018; 59: 1285–91. [PubMed][CrossRef]
10. Høydahl E. Innvandrere og norskfødte med innvandrerforeldre i Oslo. Rapport 2014/23. Oslo: Statistisk sentralbyrå, 2014. [https://www.ssb.no/befolkning/artikler-og-publikasjoner/\\_attachment/184456?\\_ts=146dc7a9e90](https://www.ssb.no/befolkning/artikler-og-publikasjoner/_attachment/184456?_ts=146dc7a9e90) Accessed 17.11.2020.
11. Le M, Hofvind S, Tsuruda K et al. Lower attendance rates in BreastScreen Norway among immigrants across all levels of sociodemographic factors: a population-based study. *J Public Health* 2019; 27: 229–40. [CrossRef]
12. Bhargava S, Akshen LA, Bukholm IRK et al. Performance measures among non-immigrants and immigrants attending BreastScreen Norway: a population-based screening programme. *Eur Radiol* 2019; 29: 4833–42. [PubMed][CrossRef]
13. Hofvind S. red. Cancer in Norway 2016. Special Issue: The Norwegian Breast Cancer Screening Program, 1996–2016: Celebrating 20 years of organised mammographic screening. Oslo: Kreftregisteret, 2017.

- [https://www.kreftregisteret.no/globalassets/cancer-in-norway/2016/mammo\\_cin2016\\_special\\_issue\\_web.pdf](https://www.kreftregisteret.no/globalassets/cancer-in-norway/2016/mammo_cin2016_special_issue_web.pdf) Accessed 17.11.2020.
14. Statistisk sentralbyrå. Slik definerer SSB innvandrere. <https://www.ssb.no/befolkning/artikler-og-publikasjoner/slik-definerer-ssb-innvandrere/> Accessed 28.8.2020.
15. Bray F, Ferlay J, Soerjomataram I et al. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin* 2018; 68: 394–424. [PubMed][CrossRef]
16. Leinonen MK, Campbell S, Ursin G et al. Barriers to cervical cancer screening faced by immigrants: a registry-based study of 1.4 million women in Norway. *Eur J Public Health* 2017; 27: 873–9. [PubMed][CrossRef]
17. Abebe DS. Public health challenges of immigrants in Norway: a research review. Oslo: Nasjonalt kompetansesenter for migrasjons- og minoritetshelse, 2010. <https://www.fhi.no/globalassets/dokumenterfiler/rapporter/2010/public-health-challenges-of-immigrants-in-norway-nakmireport-2-2010.pdf> Accessed 17.11.2020.
18. Diaz E, Calderón-Larrañaga A, Prado-Torres A et al. How do immigrants use primary health care services? A register-based study in Norway. *Eur J Public Health* 2015; 25: 72–8. [PubMed][CrossRef]
19. Johansen PA. Hver tredje koronapasient ved sykehus i Norge ble født i et annet land. *Aftenposten* 17.7.2020. <https://www.aftenposten.no/norge/i/70bkbK/hver-tredje-koronapasient-ved-sykehus-i-norge-ble-foedt-i-et-annet-land> Accessed 4.11.2020.
20. Gabrielsen E, Lundetræ K. Hvor godt forstår voksne nordmenn skriftlig helseinformasjon? *Sykepleien* 2014; 1: 26–34. [CrossRef]
21. Statistisk sentralbyrå. Familier og husholdninger, 1. januar 2016. <https://www.ssb.no/befolkning/statistikker/familie/aar/2016-10-28?fane=tabell&sort=nummer&tabell=281875> Accessed 4.11.2020.
22. Statistisk sentralbyrå. Befolkningens utdanningsnivå, 1. oktober 2013. <https://www.ssb.no/utdanning/statistikker/utniv/aar/2014-06-19?fane=tabell&sort=nummer&tabell=181252> Accessed 4.11.2020.
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