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How do immigrants use primary health care services? A register-based study in Norway

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Background: Immigrant's use of primary health care (PHC) services differs from that of native's, but studies are non-consistent, and the importance of individual explaining variables like socio-economic status, morbidity burden and length of stay in the host country is uncertain. **Methods:** Registry-based study using merged data from the National Population Register and the Norwegian Health Economics Administration Database for all immigrants and natives ≥15 years registered in Norway in 2008 (3 739 244 persons), applying the Johns Hopkins ACG® Case-Mix System. Using multivariate binary logistic and negative binomial regression analyses, respectively, we compared overall use of PHC and number of visits to PHC between immigrants and natives, and investigated the significance of socio-economic, immigration and morbidity variables. **Results:** A significantly lower percentage of immigrants used the general practitioner (GP) compared with natives. Among GP users, however, most immigrants used the GP at a 2–15% significantly higher rate compared with natives. Older immigrants used their GP less and at lower rates than younger immigrants. A significantly lower percentage of immigrants from high-income countries, but a higher percentage of all other immigrants used emergency services compared with natives, with no differences in use rates. Morbidity burden and length of stay were essential explaining variables.
Conclusion: Lower use of PHC among immigrants could be due to better health or to access barriers, and should be further studied, especially for the oldest immigrants. Adjusted high frequency of use may be appropriate, but it might also be a signal of non-effective contacts.

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Introduction

The number of immigrants in Europe is substantial and growing. In 2010, an estimated 72.6 million migrants lived in the World Health Organization (WHO) European region, constituting 8.7% of the total European population.[1] Research on the health of migrants, including on use of health care services and associations between use and socio-economic status, burden of morbidity and length of stay in the host country, is an essential pre-condition for providing appropriate and accessible services to immigrants.[2,3] Information from primary health care (PHC) is specially needed, as it is the first level of care where people present their health complains and where the majority of health needs are satisfied.[4]

However, our knowledge about how immigrants use PHC services and the importance of individual explaining variables for use is still inconsistent. In a systematic review, Nørredam et al.[5] found several studies in Europe showing overall higher general practitioner (GP) use among migrants compared with non-migrants, although differences were seen in relation to country of birth, age and sex. While factors related to health and socio-economic status explained some of these results,[6–8] this was not so in all studies.[9] Furthermore, a few studies reported no differences in use[10] or lower use of GP among subgroups of immigrants.[11,12] Some studies finding lower GP utilization by immigrants suggested a higher utilization of EPC services as a form of compensation of care,[13] although other studies did not support this hypothesis.[9]

Another review by Uiters et al.[14] concluded that, compared with the general population, immigrant groups did not make an excessive demand upon the PHC system. However, they also remarked variations across countries of origin, and that studies taking confounders into account more often reported lower PHC use among immigrants. Of the most frequently applied confounders, health status related most strongly to differences in use of PHC between non-immigrants and immigrants.[14] Length of stay in the host country has also been found to worsen immigrant's health[15] and increase the use of services.[16]

Most of the studies referred above were, however, based on health surveys, subject to potential selection bias and loss to follow-up, included often only immigrants from a few countries, and largely relied on self-reported indicators of health. Recently, two studies based on electronic medical records in Spain found lower use of PHC among immigrants[17] though differences disappeared for adults when adjusting for morbidity burden.[18]

PHC in Norway includes GP and emergency care services (EPC). By means of a nationwide registry study and applying the Johns Hopkins ACG® Case-Mix System (the ACG® System) for health assessment,[19] we (i) described and compared the use and frequency of use of PHC services between immigrants and natives in Norway; and (ii) investigated the importance of morbidity burden, socio-economic status and length of stay in Norway for immigrants' use of PHC services.

Methods

This is a register-based study using merged data for 2008 from the National Population Register and the Norwegian Health Economics

Administration database (HELFO). Individual identification numbers assigned to all native citizens and immigrants staying in Norway for at least 6 months were used to link the registries. Once an immigrant has obtained this identification number, he or she has similar access to PHC services as natives.

From the National Population Register, we obtained variables for all residents including gender, age, immigration category, country of origin, length of stay in Norway, place of residence,[20] marital status, education level and personal income. For analyses, income was categorized in accordance with the WHO[21]: low income was defined as 60% below the median income and high income as 60% above the median income in Norway in 2008. HELFO contains administrative claims for all patient contacts within PHC in Norway. This database includes diagnosis based on the International Classification of Primary Care (ICPC-2) for the purpose of administrative claims received from GPs and EPC services.

All natives (born in Norway with both parents born in Norway) and immigrants (born abroad with both parents from abroad) ≥15 years who were registered in Norway in 2008 were included in the study. Immigrants were divided according to the World Bank income categories of their country of origin into low-income (LIC) like Somalia and Afghanistan, lower-middle income (LMIC) like Pakistan and Vietnam, upper-middle income (UMIC) like Iraq and Bosnia-Herzegovina and high-income countries (HIC) like Poland and Sweden.[22]

The Johns Hopkins University Adjusted Clinical Groups case-mix system (ACG® System) was used to classify patients into morbidity groups. The ACG System assigned all ICPC-2 diagnosis given to a patient to one of 32 clusters named Aggregated Diagnosis Groups™, or ADGs. Individual diseases or conditions are placed into a specific ADG cluster based on five clinical dimensions: duration, severity and aetiology of the condition, diagnostic certainty and specialty care involvement.[19] Thus, each ADG is a grouping of diagnosis similar in terms of both clinical criteria and expected need for healthcare resources. Individuals may have up to 32 ADGs, with a non-proportional increasing degree of mobidity burden with higher number of ADGs.

Descriptive analyses, including demography, morbidity burden and use of services, were conducted. We aimed to compare the use of PCH between immigrants and natives in two ways: first, to compare the percentage of each population who had used the PHC system (GPs, EPC and both) in 2008 and, second, the frequency of use among PHC users. For these purposes, different outcome variables were created and regression models conducted. Binary logistic regression analyses were conducted to study use of PHC defined by three dichotomous variables as if the person had visited (i) a GP, (ii) the EPC and (iii) either of them at least once in 2008. Similarly, but only for PHC users, negative binomial regression was conducted to study the frequency of use through the outcome variables (i) number of visits to the GP, (ii) number of visits to the EPC and (iii) number of visits to both of them in 2008. Negative binomial regression was chosen because the count outcome variables were over-dispersed. For all analyses, native Norwegians were the reference population and immigrants were divided into groups as explained above.

Several binary logistic and negative binomial regression models were conducted adjusting for different variables, including gender, age (categorised into 15–44, 45–64 and 65+) and socio-economic status (education level, income level, civil status categorised as married or not and place of residence). Because data regarding morbidity burden (number of ADGs) were only available for users, morbidity burden was only included in negative binomial analyses, which were restricted to users. Variables that reduced the unexplained variance of the model were identified using Nagelkerke's pseudo R^2 measures for binary logistic and likelihood ratio tests for negative binomial analyses, and by looking at the correct percentages of the population identified by the models.

Results for the full models were also conducted stratified by age, as the pattern of use of services seemed to differ according to age group.

The associations between length of stay and the use of PHC (yes/no) and frequency of use were investigated using binary logistic and negative binomial regression analyses respectively for immigrants with different lengths of stay adjusting for age, gender and income level (and morbidity burden for frequency among users) and presented graphically using natives as the reference group.

Analyses were conducted in SPSS 20.0 and Stata 12.0.

This study is part of the project 'Immigrants' health in Norway', which was approved by the Regional Committee for Medical and Health Research Ethics, the Norwegian Data Inspectorate, the Norwegian Labour Welfare Service and the Norwegian Directorate of Health. The Norwegian Social Science Data Service prepared the final anonymous data file.

Results

The study population comprised 3 739 244 persons of whom 10.4% were immigrants, and is described in table 1. Immigrants were younger than natives, and there were fewer women among HIC and LIC immigrants compared with natives and other immigrants. HIC immigrants were more similar to natives than other immigrants in terms of income and education levels. Those from LIC had the shortest length of stay in Norway. Regarding morbidity burden, native Norwegians had more diagnose groups, expressed as ADGs, compared with immigrants. However, MIC immigrants had five or more ADGs as often as natives.

A significantly lower percentage of immigrants compared with natives used the GP in 2008, but the opposite was true for EPC use, except for HIC immigrants. However, overall use of PHC services was still lower for immigrants. A higher percentage of all immigrants except those from HIC had several visits to both GPs and EPC compared with natives, with ratios of visits to EPC per 100 visits to the GP of 7.2 for natives, 6.5 for HIC immigrants, and 8.6, 7.4 and 8.8 for those from UMIC, LMIC and LIC, respectively. Demographic differences between PHC users and non-users were similar across immigrants and natives (results not shown). Non-users were younger, more often men, with higher level of education and income and shorter stay in Norway (for immigrants). Persons with no income, however, were overrepresented among immigrant non-users from all but HIC compared with natives.

To explore if immigrants visited EPC instead of or additionally to GP services, the percentage of each group who visited the EPC was calculated for GP users and non-users in 2008 (Supplementary figure S1). The main differences in use of EPC between immigrants and natives were drawn by patients who already used their GP.

Different models of binary logistic regression for the dichotomous outcome variables use of GP, use of EPC and use of both were conducted. The model that best explained use of services included adjustment for age, gender, income level and civil status (table 2). Compared with natives, significantly fewer immigrants from all but LIC used their GP and all PHC services, but a higher share of immigrants except those from HIC used the EPC. The adjusted results for three age groups are also presented in table 2. Immigrants ≥65 years from all but HIC used GPs less than other age groups, and the same was true for overall use of PHC, although older immigrants from LIC used the EPC most.

Negative binomial regression analyses conducted for the number of visits to GP, EPC and to both including only users of each of the services are presented in table 3 as incidence rate ratios (IRR) adjusted for different variables. Burden of morbidity was the variable with the highest effect size regarding frequency of use of PHC. In the fully adjusted model, compared with natives, the rates of use of GP and total use of PHC were between 2 and 15%

Table 1 Demographics, morbidity burden and use of services for natives and immigrants 15 years and older in Norway in 2008

	Natives from Norway	HIC[a] immigrants	UMIC[b] Immigrants	LMIC[c] Immigrants	LIC[d] Immigrants
Numbers	3 349 721	183 714	90 689	78 548	36 572
Demographic information					
15–44 years, %	46.5	60.9	71.7	69.0	83.7
45–64 years, %	32.4	28.6	23.6	26.7	14.7
65+, %	21.1	10.5	4.7	4.3	1.6
Women, %	50.7	45.4	52.6	53.1	45.9
Income categorised, %					
No income	26.4	20.7	30.2	30.5	36.8
Low income	16.7	15.7	20.7	18.5	25.8
Middle income	44.1	52.3	43.6	44.0	34.9
High income	12.9	11.3	5.5	7.0	2.5
Education categorised, %					
No education	0.1	0.6	2.4	3.4	5.5
Low education	29.8	23.1	41.4	43.2	55.2
Middle education	44.2	32.7	29.2	29.1	22.0
High education	25.9	43.6	27.0	24.3	17.3
Migration					
Years living in Norway, mean	n.a.	13.0	11.2	14.4	7.6
Morbidity burden [Aggregated Diagnosis Groups™ (ADGs)]					
Mean number ADGs	2.2	1.5	2.0	2.1	2.0
0 ADGs, %	21.6	42.6	28.4	28.1	29.0
1–4 ADGs, %	66.5	50.2	59.6	59.9	60.1
5 or more ADGs, %	12.0	7.2	12.0	12.0	10.9
Use of primary care					
Visits to GP					
No visit to GP, %	30.3	48.3	33.8	33.3	33.9
1–3 visits GP, %	42.0	32.5	36.7	36.0	38.3
4 or more visits GP, %	27.7	19.3	29.4	30.6	27.8
Mean number of visits to GP	2.78	1.96	2.92	3.02	2.78
Visits to Emergency Primary Care (EPC)					
No visit to EPC, %	87.6	91.1	85.4	86.5	85.4
1 visit to EPC, %	9.6	7.1	10.9	10.1	10.8
2 or more visits to the EPC, %	2.7	1.7	3.7	3.4	3.8
Mean number of visits to EPC	0.17	0.11	0.21	0.19	0.21
Visits to PHC: either GP or EPC					
Used PHC, %	71.1	53.7	68.3	68.6	68.3

a: HIC High-income countries.
b: UMIC Upper middle-income countries.
c: LMIC Lower middle-income countries.
d: LIC Low-income countries.

significantly higher for immigrants, although there was no difference in EPC visits. Also for these analyses, the oldest immigrants presented lower rates of use of PHC compared with other age groups (results not shown).

The adjusted odds ratios (OR) for overall use of PHC services and the IRR for PHC visits among immigrant users by length of stay in Norway are presented in figure 1 with natives as reference population. All immigrant groups beginning at a lower level of use, their use increased rapidly during the first six to eight years, most of them reaching higher levels than natives, and slowly tended to converge to native levels after longer time in Norway. There was no association between length of stay and the rate of visits to PHC services, which was higher for immigrants compared with natives from the beginning.

Discussion

In our study, a significantly lower percentage of immigrants used the GP compared with native Norwegians, and adjustment for age, gender and socio-economic variables slightly reduced the differences between them. Among GP users, however, immigrants used the GP at a statistically significant 2 to 15% higher rate compared with natives after adjustment for the abovementioned variables plus morbidity burden. Most immigrants ≥65 years used their GP less

and at lower rates than younger immigrants and natives. Regarding emergency services, HIC immigrants used them significantly less, but a higher share of all other immigrants used the EPC compared with natives. This higher use did not compensate for less use of GPs in terms of overall use of PHC. The use of PHC services, but not the rate of use, increased with length of stay in Norway.

The nationwide coverage, with inclusion of all registered immigrants and no selection bias, as well as the possibility to group immigrants according to their country of origin, recognising the heterogeneity of the population we call immigrants, are among the strengths of our study. In addition, few studies of PHC use have included information on both morbidity burden and socio-economic information before. Our study is however not free from limitations. To adjust for morbidity burden, we used diagnoses registered for the purpose of administrative claims. This was the only possibility to address diagnoses in Norway at a national level, but has two main limitations. On the one hand, patients with illness who had not used primary care in 2008 were wrongly assumed to be healthy. For this reason, we only adjusted users for morbidity burden. On the other hand, the accuracy of diagnoses given for administrative claims is lower compared with, for instance, electronic medical records. However, the use of ICPC-2[23,24] and the ACG System are widely validated[25,26] to compare populations, which was the aim of this study.

Table 2 Use of PHC services: GP, EPC and both services (yes/no for each variable) for all immigrants and by age group

	Use of GP (yes/no)		Use of EPC (yes/no)		Use of primary care (yes/no)	
	Odds ratio	Nagelkerke R Square	Odds ratio	Nagelkerke R Square	Odds ratio	Nagelkerke R Square
Norway (ref)	1		1		1	
High-income countries, all	0.49**	0.071	0.68**	0.011	0.48**	0.065
15–44 years	0.41**	0.093	0.61**	0.010	0.40**	0.086
45–64 years	0.59**	0.051	0.79**	0.011	0.59**	0.049
65+ years	0.84**	0.029	0.88**	0.005	0.83**	0.026
Upper-middle income countries, all	0.90**	0.071	1.12**	0.011	0.89**	0.065
15–44 years	0.91**	0.093	1.12**	0.010	0.90**	0.086
45–64 years	1.07**	0.051	1.16**	0.011	1.05*	0.049
65+ years	0.55**	0.029	0.97	0.005	0.54**	0.026
Lower-middle income countries, all	0.90**	0.071	1.04**	0.011	0.89**	0.065
15–44 years	0.86**	0.093	0.98	0.010	0.84**	0.086
45–64 years	1.23**	0.051	1.22**	0.011	1.22**	0.049
65+ years	0.50**	0.029	0.98	0.005	0.50**	0.026
Low income countries, all	1.00	0.071	1.05**	0.011	0.99	0.065
15–44 years	1.06**	0.093	1.07**	0.010	1.04*	0.086
45–64 years	1.15**	0.051	1.13*	0.011	1.13**	0.049
65+ years	0.65**	0.029	1.55**	0.005	0.68**	0.026

Results of binary logistic regression analyses across immigrant groups, adjusted for age, gender, marital status and income level. Norway used as the reference country.
Age: adjusted as three categories when conducting analyses for all individuals, and as continuous variable when conducting analyses for each age group separately.
*Significant result at the $P < 0.05$ level.
**Significant result at the $P < 0.001$ level.

Our study is in agreement with others finding lower use of PHC among immigrants.[11,12,14] Moreover, new and deeper insight into the patterns of PHC use among immigrants is provided. First, and opposed to the hypothesis of compensation of use between GPs and EPC services,[13,18] overall PHC use was still lower and immigrants using EPC services more often seemed to be also GP users. Second, once they visited their GP, immigrants had a higher probability of visiting their GP several times compared with natives. However, differences between immigrant and natives, though statistically significant, represented only 0.1% of the total number of consultations per year in Norway. Third, elderly immigrants used PHC differently and generally less compared with younger immigrants, some of whom used PHC more than Norwegians of the same age. Last, immigrants with no income were overrepresented among immigrants who did not use PHC.

The nature of our study does not allow us to give reasons for our findings. There might be several explanations for why a lower share of immigrants uses PHC, but those who use the system do it more often than natives, including the personal, the cultural, the linguistic, and the system related. Low use can be adequate if immigrants are healthier, as suggested in the literature,[16] but it can also be due to access barriers, as suggested by lower socio-economic status among non-user immigrants. Likewise, high utilization rates among users may be appropriate and reflect the extra time needed when using interpreters or to build a trusting relationship between the patient and the GP,[27] but might also be a signal of slower diagnosis of disease.[28]

As explained above, our study identifies the oldest immigrants as different users of the PHC system compared with younger immigrants and natives. Although this could be partially explained by remigration to the country of origin after retirement,[29] recent studies in Norway find very low percentages of back-migration among this group.[30] In addition, our results are in contrast with those from the European Union, where older immigrants used more health services than natives.[31] Thus, older immigrants' use of services in Norway should be further studied, as this group might find more access barriers to PHC.

According to a previous study, unexplained factors seemed to determine to a great extent disparities in the probability of immigrants relative to natives of using emergency services, while individual characteristics were more important in explaining the differences in use of GPs between immigrants and natives.[32] Fitting with other studies,[14,18] ours confirms the importance of adjusting for morbidity burden, which was the main explaining factor for frequency of use. However, Nagelkerke's pseudo R^2 in our models reached only 0.071, indicating that even though our predictors were significant, there are other relevant predictors for PHC use. Thus, our results should be further confirmed using more accurate measurements of disease burden for the whole study population, and the importance of other socio-economic factors, both previous to and after migration, should not be forgotten. We divided immigrants depending on the wealth of their countries of origin, and immigrants from HIC differed actually from other immigrants in PHC use. Higher income and education levels were interrelated and also predictors for service use, though weaker than burden of morbidity, and the final models excluded education probably because of missing information for the youngest. Recently, the question regarding the consistent association between socio-economic variables across different ethnic groups has been raised,[33] and the differences in income between some immigrants and natives who did not use PHC deserve further study of non-users.

According to other studies,[34,35] a lower percentage of immigrants used PHC compared with natives during the first years in Norway, but immigrants' use increased with time to above native levels. Supporting one study that suggested that increasing frequency of use with time happens before health decline,[16] length of stay did not change frequency of use. These findings, together with the higher rates of visits among users could indicate that immigrants are not getting what they expect from PHC services, or are 'over-serviced but underserved', as recently suggested by Flynn et al.[27] Further qualitative research could help to answer this question.

Overall, this study reveals the importance of differentiating between use and frequency of use for immigrants, assessing burden of disease, socio-economic factors and time of stay in the country when planning appropriate and accessible PHC services. Alternative models of care delivery could be explored including the users in their development and evaluation.

Table 3 Frequency of use of PHC services: Number of visits to GP, EPC and both services for each of the service users' IRR: Results of different models of negative binomial regression across immigrant groups

	Use of GP		Use of EPC		Use of primary care	
	IRR	Log likelihood	IRR	Log likelihood	IRR	Log likelihood
Model 1: Unadjusted results						
Norway (ref)	1	−6205011	1	−595832.6	1	−6467643
High-income countries	0.95**		0.95**		0.94**	
Upper-middle income countries	1.10**		1.03**		1.11**	
Lower-middle income countries	1.13**		1.03**		1.14**	
Low income countries	1.05**		1.04*		1.06*	
Model 2: Adjusted by age[a] and gender						
Norway (ref)	1	−6144679	1	−595885.3	1	−6408658
High-income countries	0.98**		0.95**		0.97**	
Upper-middle income countries	1.22**		1.04**		1.22**	
Lower-middle income countries	1.24**		1.03**		1.24**	
Low income countries	1.20**		1.04*		1.20**	
Model 3: Adjusted by age,[a] gender, income and civil status						
Norway (ref)	1	−6090254	1	−590395	1	−6351453
High-income countries	0.98**		0.96**		0.97**	
Upper-middle income countries	1.18**		1.02		1.18**	
Lower-middle income countries	1.20**		1.02*		1.20**	
Low income countries	1.14**		0.99		1.14**	
Model 4: Adjusted by age,[a] gender and burden of morbidity						
Norway (ref)	1	−5656161[b]	1	−579224[b]	1	−5831999[b]
High-income countries	1.03**		0.99		1.02**	
Upper-middle income countries	1.15**		1.02*		1.15**	
Lower-middle income countries	1.18**		1.01		1.17**	
Low income countries	1.15**		1.03*		1.15**	
Model 5: Adjusted by age,[a] gender, income, civil status and burden of morbidity						
Norway (ref)	1	−5615660[c]	1	−575424.4[c]	1	−5790864.4[c]
High-income countries	1.02**		1.00		1.02**	
Upper-middle income countries	1.13**		1.01		1.13**	
Lower-middle income countries	1.15**		1.01		1.15**	
Low income countries	1.12**		1.01		1.12**	

Norway used as the reference country. IRR, Incidence rate ratios.
a: Age in three categories (15–44 years; 45–64 years; 65+).
b: Likelihood Ratio Test (Model 4 vs. Model 2) $P < 0.05$.
c: Likelihood Ratio Test (Model 5 vs. Model 3) $P < 0.05$.
*Significant result at the $P < 0.05$ level.
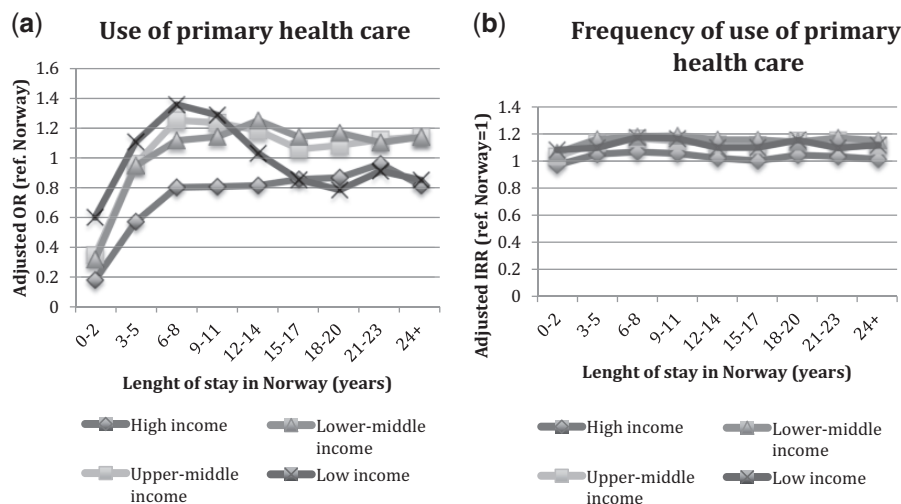**Significant result at the $P < 0.01$ level.

Figure 1 Use and frequency of use of primary care services for different immigrant groups by length of stay in Norway. (a) Odds ratios (OR) for overall use of PHC services (yes/no). Results adjusted for age, gender, civil status and income level. Reference Norway (OR = 1). (b) Incidence rate ratios (IRR) for visits to PHC services for PHC users. Results adjusted for age, gender, civil status, income level and morbidity burden (number of ADGs). Reference Norway (IRR = 1)

Supplementary data

Supplementary data are available at *EURPUB* online.

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Key points

- A significantly higher percentage of native Norwegians used the GP compared with immigrants in 2008. Among GP users, however, immigrants used the GP at a significantly higher rate compared with natives.
- Most immigrants ≥65 years used their GP less and at lower rates than younger immigrants and natives.
- A higher share of immigrants from middle and low-income countries used the emergency services compared with natives. This higher use did not compensate for less use of GPs in terms of overall use of PHC.
- It is important to differentiate between use and frequency of use when planning appropriate and accessible PHC services for immigrants. Alternative models of care delivery could be explored for elderly immigrants including the users in their development and evaluation.

References

1   Rechel B, Mladovsky P, Ingleby D, et al. Migration and health in an increasingly diverse Europe. *Lancet* 2013;381:1235–45.

2   Rechel B, Mladovsky P, Deville W. Monitoring migrant health in Europe: a narrative review of data collection practices. *Health Policy* 2012;105:10–6.

3   Helsedirektoratet. *Nasjonal Strategi om Innvandreres helse 2013-2017* (Norwegian National Strategy Document on Immigrant Health). Oslo: Helsedirektoratet, 2012.

4   Kringos DS, Boerma WGW, Zee Jv, Groenewegen PP. Political, cultural and economic foundations of primary care in Europe. *Soc Sci Med* 2013;99:9–17.

5   Nørredam M, Nielsen SS, Krasnik A. Migrants' utilization of somatic healthcare services in Europe—a systematic review. *Eur J Public Health* 2010;20:555–63.

6   Reijneveld SA. Reported health, lifestyles, and use of health care of first generation immigrants in The Netherlands: do socioeconomic factors explain their adverse position? *J Epidemiol Commun Health* 1998;52:298–304.

7   Livingston G, Leavey G, Kitchen G, et al. Accessibility of health and social services to immigrant elders: the Islington Study. *Br J Psychiatry* 2002;180:369–73.

8   Hjern A, Haglund B, Persson G, Rosen M. Is there equity in access to health services for ethnic minorities in Sweden? *Eur J Public Health* 2001;11:147–52.

9   Uiters E, Deville WL, Foets M, Groenewegen PP. Use of health care services by ethnic minorities in The Netherlands: do patterns differ? *Eur J Public Health* 2006;16:388–93.

10 Antón J-I, Bustillo RMD. Health care utilisation and immigration. *Eur J Health Econ* 2010;11:487–98.

11 Sproston KA, Pitson LB, Walker E. The use of primary care services by the Chinese population living in England: examining inequalities. *Ethnicity Health* 2001;6:189–96.

12 Hargreaves S, Friedland JS, Gothard P, et al. Impact on and use of health services by international migrants: questionnaire survey of inner city London A&E attenders. *BMC Health Serv Res* 2006;6:153.

13 Goth US, Godager G. Use of primary care emergency services in norway: impact of birth country and duration of residence. *Nord J Health Econ* 2012;1:171–86.

14 Uiters E, Deville W, Foets M, et al. Differences between immigrant and non-immigrant groups in the use of primary medical care; a systematic review. *BMC Health Serv Res* 2009;9:76.

15 Fuller-Thomson E, Noack AM, George U. Health decline among recent immigrants to Canada: findings from a nationally-representative longitudinal survey. *Can. J. Public Health* 2011;102:273–80.

16 McDonald JT, Kennedy S. Insights into the ''healthy immigrant effect'': health status and health service use of immigrants to Canada. *Soc Sci Med* 2004;59:1613–27.

17 Gimeno-Feliu LA, Magallon-Botaya R, Macipe-Costa R, et al. Diferences in the use of primary care services between spanish national and immigrant patients. *J Immigr. Minor. Health* 2013;15:584–90.

18 Calderón-Larranaga A, Gimeno-Feliu LA, Macipe-Costa R, et al. Primary care utilisation patterns among an urban immigrant population in the Spanish National Health System. *BMC Public Health* 2011;6:432.

19 Weiner JP. *The Johns Hopkins ACG System*. Technical Reference Guide Version 10.0. Baltimore, MD: The Johns Hopkins University, Bloomberg School of Public Health, 2011.

20 Statistics Norway S. *Classification of Centrality*. 2013. Available at: http://www.ssb.no/metadata/conceptvariable/vardok/927/en (February 2014, date last accessed).

21 European Commission. *Research Findings-Social Situation Monitor - Risk of Poverty on Basis of Different Thresholds*. Available at: http://ec.europa.eu/social/main.jsp?catId=1050&intPageId=1894&langId=en. (February 2014, date last accessed).

22 Word Bank. Available at: http://data.worldbank.org/news/new-country-classifications (February 2014, date last accessed).

23 *International Classification of Primary Care Second Edition (ICPC-2): Literature review*. Research and Development Divission, Center for Health Information, 2006.

24 Frese T, Herrmann K, Bungert-Kahl P, Sandholzer H. Inter-rater reliability of the ICPC-2 in a German general practice setting. *Swiss Med Wkly* 2012;142:w13621.

25 Orueta JF, Nuno-Solinis R, Mateos M, et al. Predictive risk modelling in the Spanish population: a cross-sectional study. *BMC Health Serv Res* 2013;13:269.

26 Sibley LM, Moineddin R, Agha MM, Glazier RH. Risk adjustment using administrative data-based and survey-derived methods for explaining physician utilization. *Med Care* 2010;48:175–82.

27 Flynn PM, Ridgeway JL, Wieland ML, et al. Primary care utilization and mental health diagnoses among adult patients requiring interpreters: a retrospective cohort study. *J Gen Intern Med* 2013;28:386–91.

28 Lyratzopoulus G, Neal RD, Barbiere JM, et al. Variation in the number of general practitioner consultations before hospital referral for cancer: findings from a the 2010 National Cancer Patient Experience Survey in England. *Lancet Oncol* 2012;13:353–65.

29 Razum O. Commentary: of salmon and time travellers- musing on the mystery of migrant mortality. *Int J Epidemiol* 2006;35:919–21.

30 Mørk E. *Seniorer i Norge 2010 (Elderly in Norway 2010)*. Oslo: Statistics Norway, 2011.

31 Solé-Auró A, Guillén M, Crimmins EM. Health care usage among immigrants and native-born elderly populations in eleven European countries: results from SHARE. *Eur J Health Econ* 2012;13:741–54.

32 Jiménez-Rubio D, Hernández-Quevedo C. Inequalities in the use of health services between immigrants and the native population in Spain: what is driving the diferences? *Eur J Health Econ* 2011;12:17–28.

33 Fischbacher CM, Cezard G, Bhopal RS, et al. Measures of socioeconomic position are not consistently associated with ethnic differences in cardiovascular disease in Scotland: methods from the Scottish Health and Ethnicity Linkage Study (SHELS). *Int J Epidemiol* 2014;43:129–39.

34 Dias SF, Severo M, Barros H. Determinants of health care utilization by immigrants in Portugal. *BMC Health Serv Res* 2008;8:207.

35 Lebrun LA. Effects of length of stay and language proficiency on health care experiences among immigrants in Canada and the United States. *Soc Sci Med* 2012;74:1062–72.