

The primary care workforce in Europe: a cross-sectional international comparison of rural and urban areas and changes between 1993 and 2011

Peter P. Groenewegen^{1,2}, Mark W.G. Bosmans¹, Wienke G.W. Boerma¹, Peter Spreeuwenberg¹

1 Nivel – Netherlands Institute for Health Services Research, Utrecht, The Netherlands

2 Departments of Sociology and Human Geography, Utrecht University, Utrecht, The Netherlands

Correspondence: Peter P. Groenewegen, NIVEL, PO Box 1568, 3500 BN, Utrecht, The Netherlands,

e-mail: p.groenewegen@nivel.nl

Rural areas have problems in attracting and retaining primary care workforce. This might have consequences for the existing workforce. We studied whether general practitioners (GPs) in rural practices differ by age, sex, practice population and workload from those in less rural locations and whether their practices differ in resources and service profiles. We used data from 2 studies: QUALICOPC study collected data from 34 countries, including 7183 GPs in 2011, and Profiles of General Practice in Europe study collected data from 32 countries among 7895 GPs in 1993. Data were analyzed using multilevel analysis. Results show that the share of female GPs has increased in rural areas but is still lower than in urban areas. In rural areas, GPs work more hours and provide more medical procedures to their patients. Apart from these differences between locations, overall ageing of the GP population is evident. Higher workload in rural areas may be related to increased demand for care. Rural practices seem to cope by offering a broad range of services, such as medical procedures. Dedicated human resource policies for rural areas are required with a view to an ageing GP population, to the individual preferences and needs of the GPs, and to decreasing attractiveness of rural areas.

Introduction

Despite a universal trend of urbanisation, 45% of the world population and 28% of the European population lives in rural areas.^{1,2} With specialist and hospital care often at a greater distance, many countries fail to reach rural populations with healthcare at the same level as they do urban populations.³ At the same time, healthcare needs are high in rural areas. As young people move towards urban centres for education and employment, the remaining rural populations age, with increasing health needs. For their health services, rural communities largely rely on generalist primary care workers, like general practitioners (GPs), nurses and midwives.

In addition to a lower availability of medical specialists, the number of physicians overall per 1000 inhabitants is lower in rural areas^{4–6} and the share of primary care physicians in the total physician workforce is declining in many countries.⁴ A situation of growing shortage and difficulties in finding and retaining qualified medical personnel may lead to reduced access to primary care for rural populations.^{7–13} The degree to which rural populations are in a less favourable healthcare situation depends on characteristics of the communities and on the staff, the organisation and available resources in the practices and the services provided to the patients.

In this article, we examine whether practices operating in rural areas have a different profile compared with practices in more urbanised areas in terms of characteristics of the GPs working there, the population they serve, their workload, the organisation of the practice, the available resources and the profiles of the services provided. We also examine whether the situation of rural GPs has changed between 1993 and 2012.

Hypotheses

Our expectations regarding the profiles of GPs in rural areas are driven by long-term demographic processes leading to two broad

influences. First, rural areas are increasingly unattractive due to changes in the economic structure, labour market, and availability of schools and shops, resulting in selective retention and migration. Second, GPs in rural areas have a different task environment, for example in having fewer resources and the more limited services they can provide. Moreover, as GPs in rural areas work in more restrictive situations, their personal preferences in organising the practices and developing their service profile are relatively less important, than for GPs working elsewhere. As a consequence, we expect to find less variation among GPs in rural areas.

Attractiveness of rural areas: Because rural areas are not attractive for young, especially female, doctors,⁵ we expect GPs in rural areas are older and more often male. Formerly, rural practices were often run by male GPs, assisted by their spouse. Nowadays, GPs are more often female and have a spouse with a career. Furthermore, as ageing has increased the health needs in rural areas,^{14,15} we expect that GPs there have a higher workload, in terms of consultations and working hours.¹⁶ On the other hand, job satisfaction may be higher because of less demanding patients and a greater chance of developing a long-term relationship with patients. In the comparison between 1993 and 2011, we expect increased differences because of stronger demographic contrasts between urban and rural areas.

Task environment: Because of lower population density, we expect more single-handed practices in rural areas. The patient population is expected to be older, due to migration of younger people to urban centres, but probably also more socially deprived. Concerning medical equipment, we can argue in two directions. Small-staffed practices may be less well equipped by lack of resources, and as hospitals are further away, GPs in rural practices may do more diagnostics and procedures themselves, which would require more equipment. For this reason, we also expect that rural GPs have broader curative service profiles than (semi-) urban GPs regarding first contact care, chronic disease management and

application of medical procedures. In contrast, we expect less services in the area of health promotion and disease prevention, as there is less direct demand for these services and because older, single-handed GPs with a relatively high workload are less likely to offer these services.

Methods

Data

We used data from two studies. The QUALICOPC study¹⁷ collected data between 2010 and 2012 (2011 for short) in 31 European countries plus Australia, Canada and New Zealand. We use data on GPs and their practices, collected through a survey. Questionnaire development and data collection have been described elsewhere.^{18,19} The response target per country was 220 GPs (except for very small countries). In total 7183 GPs participated: the lowest number in Malta (70) and the highest number in Canada (535, to allow for regional analysis). The Study on Profiles of General Practice in Europe collected data in 1993 in 31 European countries plus Israel, through a GP/practice survey.²⁰ Procedures were largely similar to the procedures used in QUALICOPC study and have been described elsewhere.²⁰ In total 7895 GPs participated in the survey: the lowest number in Iceland (52) and the highest number in Israel (673). A number of questions from the 1993 survey were repeated in 2011, providing for comparisons between both years. Questions and answering categories for backgrounds, practice location and services were identical or slightly revised without changing the meaning.²¹

Measurements

Our key variable was urbanisation of the practice location, which was measured in the same way in both surveys by self-classification in five categories: big (inner) city, suburbs, (small) town, mixed urban/rural, and rural. These were recoded into four by combining 'suburbs' and '(small) towns'. GPs' age and sex were measured through survey questions. Characteristics of the practice population were subjectively measured in both surveys by asking: 'To what extent do you think your practice population compares to the average national level with respect to the following categories?' 1. Elderly people (over 70 years); 2. Socially disadvantaged people, with answering categories 'above average', 'average', 'below average' and 'don't know'.

Measurement of workload differed between both studies for numbers of hours worked but are comparable for number of consultations. In the 2011 study, GPs reported estimates of the average number of regular work hours per week, excluding evening, night and weekend shifts. In the 1993 study, GPs kept a workload diary for 1 week. Both studies did not distinguish between full-time or part-time working status. Job satisfaction was measured in both studies using a four-point scale with the following four items:²⁰ I feel that some parts of my work do not really make sense; my work still interests me as much as it ever did; my work is overloaded with unnecessary administrative detail; in my work there is a good balance between effort and reward. The items were coded so that a higher score indicates higher satisfaction.

Practice organisation was—in both surveys—characterised by co-location with other GPs (single-handed or more GPs).²² Equipment was measured by the question how many items of medical equipment were available in the practice from a list of 25 (in 1993) and 30 (in 2011). The variable used is the proportion available in the practice. The service profiles of GPs were measured the same in both surveys through their self-reported activities related to their role in first contact care (17 items), the involvement in (chronic) disease management (12 items), provision of medical procedures (10 items) and preventive care (5 items).

For each of the first three areas, GPs were asked to indicate their involvement if this occurred in their practice population, on a four-

point scale ranging from 'never' to '(almost) always'. For example, GPs were asked to state to what extent they are involved in the treatment of patients with uncomplicated type 2 diabetes or whether a man aged 35 with a sprained ankle would contact him or her as the first healthcare provider. Regarding preventive activities, questions were asked about involvement in systematic blood pressure measurement, cholesterol testing and health education (Yes/No).^{21,23}

Statistical analysis

We used the data from all countries in both surveys, although they do not completely overlap. Characteristics of the GPs/practices and service profiles were estimated with three-level multilevel regression analysis with GPs nested in observation years and countries, to take the different sample sizes into account and to be able to adjust the estimates for age and sex of the GPs. This structure reflects the repeated cross-sectional nature of the data set, with some countries only having a measurement in 1 year. We used eco-metrics to construct scales for the service profiles.²⁴ We also calculated the clustering of the GP and practice characteristics and service profiles per category of urbanisation and year. Clustering was calculated as the intra-class correlation (ICC).

To reduce the number of tests, we restricted the tests (χ^2 tests for simultaneous contrasts) to the two extreme categories of urbanisation and the 2 years. We tested whether or not the variable in question differed significantly for GPs located in (i) Inner city 1993 versus Rural 1993, (ii) Inner city 2011 versus Rural 2011, (iii) and finally, the difference (Inner city 1993 – Inner city 2011) versus the difference (Rural 1993 – Rural 2011). We used a P values of ≤ 0.05 to indicate statistical significance. The statistical analysis was performed in MLwiN.

Ethical approval

No ethical approval was required for the 1993 study. For the QUALICOPC study, it was acquired in accordance with the legal requirements in each country.²⁵

Results

Differences between GPs, practices and the service profiles in more urban versus more rural locations are shown in [figure 1](#) and [table 1](#). The selection of characteristics provided in [figure 1](#) includes average age of GPs, percentage of female GPs, average number of working hours and the provision of medical procedures, such as minor surgery. [Table 1](#) includes all characteristics, adjusted for age and sex of the GPs, and with tests for contrasts.

The general practitioners

Between 1993 and 2011, the GP population has clearly aged, irrespective of the location of the practice in rural areas or inner cities ([figure 1a](#) and [table 1](#)). Within the years, both 1993 and 2011, there are no significant differences in average age between inner city and rural locations. Regarding the sex category of GPs, there was a clear gradient in 1993 with less female GPs in rural areas, resulting in a significant difference between inner city locations and rural locations in that year. Between 1993 and 2011, the proportion of female GPs increased generally, but stronger in rural than in urban areas ([figure 1b](#) and [table 1](#)). In 1993, working in a shared accommodation was significantly more prevalent in urban than in rural locations, but in 2011, this was no longer the case.

Patient population

In 2011, the percentage of 'aged practices', where the share of elderly is above average, was significantly lower in inner city than in rural locations. The difference between inner city locations in 1993 and 2011, and between rural locations in these 2 years has become

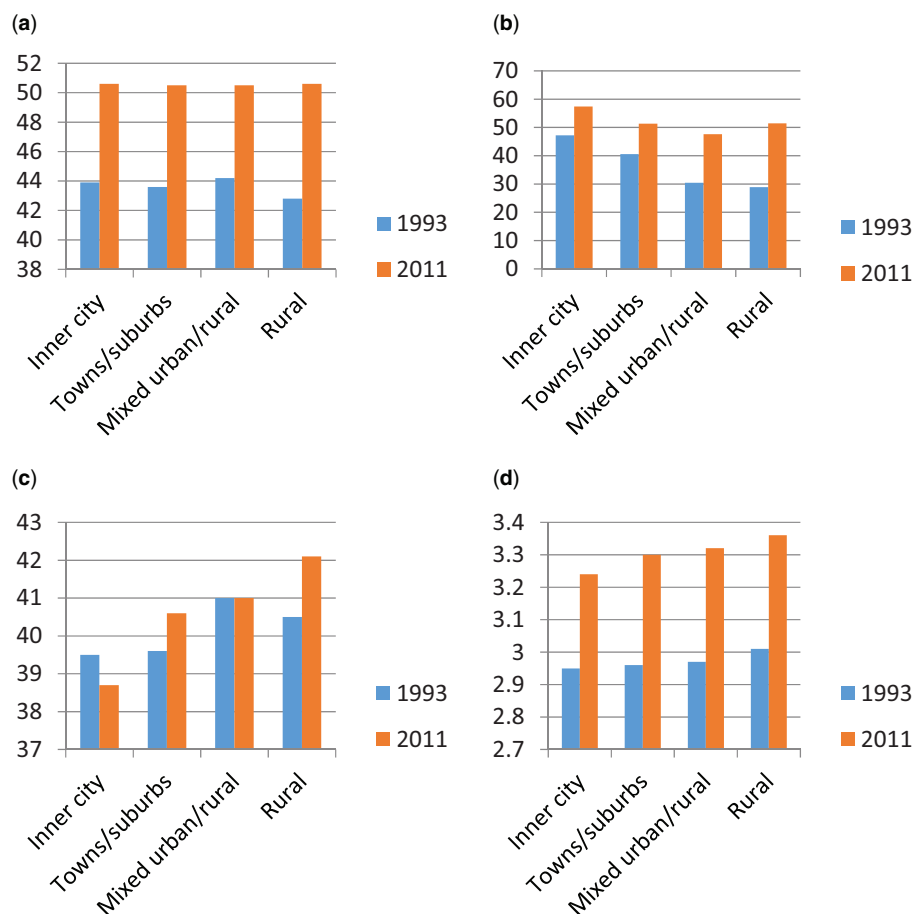


Figure 1 Characteristics of GPs in 1993 and 2011: age, sex, working hours, provision of medical procedures (all countries in each year; based on MLA, unadjusted). (a) Average age of GPs, (b) percentage female GPs, (c) number of working hours and (d) scale value for provision of medical procedures by GPs.

Table 1 Estimates of GP and practice characteristics and service profiles by urbanisation; based on multilevel regression analysis (adjusted for age and sex) with $N_{\text{countries}} 1993 = 32$, $N_{\text{GPs}} 1993 = 7895$, $N_{\text{countries}} 2011 = 34$ and $N_{\text{GPs}} 2011 = 7183$ (due to missing values the total number of GPs varies between 14 874 and 12 257)

Characteristic	Inner city		Suburbs/towns		Mixed urban/rural		Rural	
	1993	2011	1993	2011	1993	2011	1993	2011
Average age of GPs ^a	43.9	50.9	43.5	50.7	43.8	50.5	42.4	50.8
Female GPs (%) ^b	44.1 ^{c,d}	61.1	37.2	54.8	27.9	50.9	25.4	55.1
Aged practice population—elderly above average (%)	43.1 ^d	29.6 ^e	39.5	34.5	38.0	36.0	48.7	46.8
Deprived practice population—above average (%)	23.8 ^{c,d}	20.1	19.8	23.0	15.2	20.5	15.8	21.9
Working hours per day	39.6 ^d	38.7 ^e	39.6	40.6	40.8	40.9	40.4	42.1
Office consultations per day	27.6	28.8	28.9	30.7	28.9	31.4	26.9	29.3
Job satisfaction								
Parts of my work do not really make sense (rev.)	2.93	2.93	2.95	2.87	3.04	2.86	3.04	2.89
Work still interests me as much as it ever did	1.64	1.79	1.66	1.81	1.63	1.78	1.64	1.77
Work overloaded with administration (rev.)	2.23	2.01	2.23	1.98	2.19	1.90	2.16	1.97
Good balance between effort and reward	3.49	3.21	3.53	3.11	3.51	3.13	3.47	3.21
Shared accommodation (%)	68.3 ^c	69.8	70.5	65.8	69.2	65.1	41.5	50.9
Equipment (proportion from items list)	0.37	0.48	0.40	0.50	0.42	0.52	0.39	0.52
First contact with health problems (average scale value)	2.91	2.87	2.92	2.92	2.98	2.96	3.04	3.00
(Chronic) disease management (average scale value)	2.95	3.24	2.96	3.30	2.98	3.31	3.01	3.35
Medical procedures (average scale value)	1.99	2.01	1.96	2.10	2.05	2.19	2.06	2.28
Prevention (average scale value)	0.30	0.20	0.29	0.20	0.31	0.22	0.31	0.20

a: Only adjusted for sex.

b: Only adjusted for age.

c: Inner city 1993 differs significantly from Rural 1993.

d: Difference (Inner city 1993 – Inner city 2011) differs significantly from difference (Rural 1993 – Rural 2011).

e: Inner city 2011 differs significantly from Rural 2011.

smaller. In 1993, the proportion of practices with relatively more socially deprived people was significantly higher in inner city than in rural locations. Comparison between 1993 and 2011 shows that the difference in the proportion of deprived practices in inner cities is significantly smaller than in rural locations.

Workload and job satisfaction

In 2011, GP working hours were significantly higher in rural than in inner city practices, showing a clear gradient over the different locations (figure 1c and table 1). Over the years, this difference has grown: working hours in city practices decreased while those in rural areas increased. The number of face-to-face contacts per day is in general slightly higher in 2011 than in 1993. There are no clear urban–rural differences.

For job satisfaction, no differences, either between urbanisation categories or over time, are found for the items ‘Parts of my work do not really make sense’ and ‘My work still interests me as much as it ever did’. Comparison of 1993 and 2011 shows that satisfaction with the administrative burden is generally diminished as well as with the balance between effort and reward. But inner city and rural GPs do not report differently in these respects.

Service profiles and equipment

In 2011, significantly more medical equipment was available than in 1993, both in inner city and rural locations. Concerning the service profile, no systematic differences were found between types of locations in the role of GPs as doctor of first contact with health problems. This was the case in both years. The involvement of GPs in (chronic) disease management has increased overall, irrespective of location. GPs performed more medical procedures in 2011 compared with 1993 (figure 1d and table 1). There is a clearer gradient across locations in 2011, but differences are not significant. The provision of services in the area of health promotion is overall smaller in 2011 than in 1993, irrespective of practice location.

Differences between GPs and practices

We assumed that GP practices and services would differ less under restrictive circumstances, like in rural areas. This has been explored by analysing the clustering within the categories of urbanisation by calculating the ICC (see Supplementary appendix table SA). GPs in rural areas look like one another in reporting an above average share of elderly, regardless of country. In 2011, there is a slight trend in clustering in the number of working hours over the categories of urbanisation and, in 1993 and 2011, for the availability of equipment. Hence, rural GPs tend to be more homogenous on (more) working hours and (more) equipment than GPs in urban areas.

The clustering within countries as a whole is strongest for the proportion of female GPs, the number of consultations per day, the hours of work of GPs (in 1993), working in shared accommodation, the items of equipment and the provision of medical procedures. For example, up to 80% of the variation in the provision of medical procedures is on the level of countries. In these respects, GPs within a country are largely similar. Concerning job satisfaction relative strong within-countries clustering was found on the items on ‘administrative burden’ and on ‘the balance between effort and reward’. Both administrative burden and the balance between effort and reward seem related to national circumstances and thus differ between countries.

Discussion

Our study revealed important differences between rural and urban areas regarding characteristics of the GPs, their practices, workload and service profiles. In both years, 1993 and 2011, practice populations in rural areas were older and in 2011 these were more deprived as well; this partly supports the hypothesis, although not all

differences are statistically significant. The workload of GPs was higher in rural areas, particularly in 2011 for working hours, which is partly in line with the hypothesis. Differences in the characteristics of the practice population, and working hours of GPs increased between urban and rural areas, as hypothesised. Our hypothesis about relatively less female GP in rural areas was supported for 1993, but less so for 2011, due to an increase of the share of female GPs in rural areas. This reflects an increase in female GPs and the ageing of the GP populations overall. As expected, single-handed practices were more prevalent in rural areas, but to a diminishing degree. These results confirm a general trend of older, male (often single-handed) GPs gradually being replaced by female GPs working in group practices.

In contrast to what we hypothesised rural GPs were not older than urban GPs. We hypothesised urbanisation-related differences in job satisfaction, without specifying a direction. No clear gradient appeared, but satisfaction with administrative burden and the rewards-efforts balance seem to be generally decreased. GPs were better equipped in 2011 than in 1993, but urbanisation did not make a difference; hence the hypothesis is not supported. We expected broader service profiles, except for health promotion, but only found weak (not significant) gradients across locations. We found less homogeneity among rural GPs than expected; however, with the exception of the self-reported age structure of the practice population, working hours and medical equipment. So, GPs in rural areas differed less from each other than in inner city areas, in line with the hypothesis that circumstances in rural areas are more restrictive and the GPs working in more restrictive circumstances would look more like one another.

Apart from these differences in clustering, we see that most variation between countries is found in aspects of practice, such as numbers of consultations, equipment and application of technical procedures, but also in job satisfaction, most notably in the perceived balance between efforts and rewards and to a lesser extent the administrative burden. For administrative burden, this might be expected as the reality of the administrative load may also differ between countries; however, the same reasoning does not apply easily to the balance of effort and rewards, which seems more individual. Apparently, the general trend towards stronger demands on working people in modern society, differs between countries in the case of GPs.

Since 2011, demographic changes have continued and so has the epidemiologic, social and economic context of rural areas. Shops and public services, such as schools, continue to disappear from rural communities; trends that do not leave healthcare unaffected.

Limitations

Major strengths of this article are the large number of countries and many primary care practices included and the comparison between two decades apart. This enabled analyses of the differences between rural and urban practices and changes over time. Our study has limitations as well. The participation rate of the surveys varied; in 1993 the median participation rate was 51%;²⁰ in 2011 it was rather low, with 30%,¹⁹ although the response group mirrored the national GP populations in terms of age and sex. Therefore, differences in the samples may be responsible for some of the differences. The more recent data were collected around 2011. It can be expected that in the meantime the changes in rural areas have gone on, as have the changes in the GP population. This underlines the importance of monitoring the development of primary care in rural areas. Our key variable of interest was urbanisation of the practice location. GPs were asked for a subjective estimation of the urbanisation of the practice location. This may differ from a more objective assessment in terms of population density, as shown by a study of GPs in Germany.¹⁶ In the surveys we used there was no geographical location data available. Hence, there was no alternative to using subjective measures. However, when comparing countries, the subjective

nature of rurality should be taken into account (compare, for example, what people would see as rural areas in the Netherlands and in Norway).

Conclusion

Rural healthcare, which largely consists of primary care services, is high on the policy agenda of many countries,^{26–27} and international organisations.^{4,28} Unequally distribution of primary care services is a universal problem, also manifest in smaller and more densely populated countries, due to the subjective character of distances. Rural areas with longer distances to specialist services and ageing populations need well-educated and well-equipped multidisciplinary primary care teams able to cope with growing needs for complex care.²⁹ Recent research in France suggests that such teamwork could be a sustainable model that helps attract healthcare workers in currently underserved rural areas.³⁰

Policies should take into account the changing demographic, epidemiologic, social and economic context of rural and remote areas. This context also defines the situation of the primary care providers, who have their own interests and preferences, for example, a good balance between professional work and family life. Attracting and retaining primary care providers requires social support and integration of professionals, including support for their professional and career development, as well as their families. This is particularly important to attract and retain the growing female GP workforce, but may increasingly apply as well to male GPs, especially in the younger generation.

Supplementary data

Supplementary data are available at *EURPUB* online.

Acknowledgements

The authors thank the partners in the QUALICOPC project for their role throughout the study and their coordination of the data collection: W. Boerma, W. Schäfer (the Netherlands, NIVEL, Coordinator); J. De Maeseneer, E. De Ryck, L. Hanssens, A. Van Pottelberge, and S. Willems (Belgium); S. Greß and S. Heinemann (Germany); G. Capitani, S. De Rosis, A. M. Murante, S. Nuti, C. Seghieri, and M. Vainieri (Italy); D. Rotar Pavlic and I. Svab (Slovenia); and M. Van den Berg, T. Van Loenen, and D. Kringos (the Netherlands).

Funding

The study Profiles of General Practice in Europe was funded by the European Commission in the BIOMED 1 programme, grant no. BMH1-CT92-1636. The QUALICOPC study was funded by the European Commission in the Seventh Framework Programme, grant no. 242141. The present secondary analysis was not separately funded.

Conflict of interest: None declared.

Key points

- The share of female GPs has increased overall, but particularly in rural areas; however, their share is still lower compared with urban areas.
- The workload of GPs in rural areas has increased in recent years.
- GPs in rural areas have more equipment and provide more medical procedures.
- The GP population is ageing overall; the average age is equal in rural and urban practices.

References

- 1 World Bank. Rural population (% of total population). Available at: <https://data.worldbank.org/indicator> (19 May 2020, date last accessed).
- 2 ESPON. *Policy Brief Shrinking Rural Regions in Europe*. Luxembourg: ESPON, 2017.
- 3 WHO. *World Health Statistics 2016: Monitoring Health for the SDGs, Sustainable Development Goals*. Geneva: World Health Organization, 2016.
- 4 OECD. *Health Workforce Policies in OECD Countries: Right Jobs, Right Skills, Right Places*. OECD Health Policy Studies. Paris: OECD Publishing, 2016.
- 5 Ono T, Schoenstein M, Buchan J. Geographic imbalances in doctor supply and policy responses. *OECD Health Working Papers*, 2014.
- 6 OECD. *Health at a Glance 2017. OECD Indicators*. Paris: OECD Publishing, 2017.
- 7 Barriball L, Bremner J, Buchan J, et al. Recruitment and Retention of the Health Workforce in Europe, Final Report. Brussels: European Commission, Directorate-General for Health and Food Safety, 2015.
- 8 WHO. *Increasing Access to Health Workers in Remote and Rural Areas Through Improved Retention*. Geneva: WHO, 2010.
- 9 Kroezen M, Dussault G, Craveiro I, et al. Recruitment and retention of health professionals across Europe: a literature review and multiple case study research. *Health Policy* 2015;119:1517–28.
- 10 Lee DM, Nichols T. Physician recruitment and retention in rural and underserved areas. *Int J Health Care Qual Assur* 2014;27:642–52.
- 11 Verma P, Ford JA, Stuart A, et al. A systematic review of strategies to recruit and retain primary care doctors. *BMC Health Serv Res* 2016;16:126.
- 12 Marchand C, Peckham S. Addressing the crisis of GP recruitment and retention: a systematic review. *Br J Gen Pract* 2017;67:e227–e237.
- 13 Strasser R, Kam SM, Regalado SM. Rural healthcare access and policy in developing countries. *Annu Rev Public Health* 2016;37:395–412.
- 14 Anderson TJ, Saman DM, Lipsky MS, Lutfiyya MN. A cross-sectional study on health differences between rural and non-rural U.S. counties using the County Health Rankings. *BMC Health Serv Res* 2015;15:441.
- 15 Dunbar JA, Peach E. The disparity called rural health: what is it, and what needs to be done?. *Aust J Rural Health* 2012;20:290–2.
- 16 Steinhäuser J, Joos S, Szecsenyi J, Miksch A. A comparison of the workload of rural and urban primary care physicians in Germany: analysis of a questionnaire survey. *BMC Fam Pract* 2011;12:112.
- 17 Schäfer W, Boerma WGW, Kringos DS, et al. QUALICOPC, a multi-country study evaluating quality, costs and equity in primary care. *BMC Fam Pract* 2011;12:115.
- 18 Schäfer W, Boerma WGW, Kringos DS, et al. Measures of quality, costs and equity in primary healthcare: instruments developed to analyse and compare primary care in 35 countries. *Qual Prim Care* 2013;21:67–79.
- 19 Groenewegen PP, Greß S, Schäfer W. General practitioners' participation in a large, multicountry combined general practitioner-patient survey: recruitment procedures and participation rate. *Int J Family Med* 2016;2016:1–9. Article ID 4929432.
- 20 Boerma W. *Profiles of General Practice in Europe: An International Study of Variation in the Tasks of General Practitioners*. Utrecht: NIVEL, 2003.
- 21 Schäfer W, Boerma WGW, Spreeuwenberg P, et al. Two decades of change in European general practice service profiles: conditions associated with the developments in 28 countries between 1993 and 2012. *Scand J Prim Health Care* 2016;34:97–110.
- 22 Bonciani M, Schäfer W, Barsanti S, et al. The benefits of co-location in primary care practices: the perspectives of general practitioners and patients in 34 countries. *BMC Health Serv Res* 2018;18:132.
- 23 Boerma WGW, Van der Zee J, Fleming DM. Service profiles of general practitioners in Europe. *Br J Gen Pract* 1997;47:481–6.
- 24 Raudenbush SW. The quantitative assessment of neighborhood social environments. In: I Kawachi, LF Berkman, editors. *Neighborhoods and Health*. Oxford: Oxford University Press, 2003.
- 25 De Rosis S, Seghieri C. Basic ICT adoption and use by general practitioners: an analysis of primary care systems in 31 European countries. *BMC Med Inform Decis Mak* 2015;15:70.
- 26 Hämel K, Ewers M, Schaeffer D. Versorgungsgestaltung angesichts regionaler Unterschiede (Health care and regional disparities). *Z Gerontol Geriat* 2013;46:323–8.

- 27 Batenburg R, Bosmans M, Versteeg S, et al. *Balans in Vraag en Aanbod Huisartsenzorg (Balance of Demand and Supply for General Practitioner Care)*. Utrecht: Nivel and Prismant, 2018.
- 28 WHO. *Imbalances in Rural Primary Care: Brief Based on a Scoping Literature Review with an Emphasis on the WHO European Region*. Geneva: World Health Organisation, 2020.
- 29 Schäfer I, Hansen H, Ruppel T, et al. Regional differences in reasons for consultation and general practitioners' spectrum of services in northern Germany – results of a cross-sectional observational study. *BMC Fam Pract* 2020;21:22.
- 30 Chevillard G, Mousquès J, Lucas-Gabrielli V, Rican S. Has the diffusion of primary care teams in France improved attraction and retention of general practitioners in rural areas? *Health Policy* 2019;123:508–15.