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Do international medical graduates' recruitment policies help to overcome healthcare shortage areas in developed countries? A systematic review

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ABSTRACT

This review investigates the effectiveness of utilizing foreign physicians or International Medical Graduates to alleviate medical shortages in rural and underserved areas of developed countries. Conducted in February 2024, this systematic review follows PRISMA 2020 guidelines, analysing 15 English-language studies from the United States, Canada, Australia, and New Zealand. The focus is on comparing physicians with international graduation to national graduates in rural and underserved contexts. Results reveal diverse trends across countries: in the United States, national graduates are generally more represented in rural areas, while foreign physicians are more prevalent in Health Professional Shortage Areas. In Canada, foreign graduates are more common in rural areas, varying by province. Australia and New Zealand show foreign physicians practicing more in rural areas than national counterparts. This study underscores significant reliance on foreign physicians to mitigate rural healthcare disparities. While this strategy partially addresses immediate shortages, long-term effectiveness is uncertain due to retention and integration challenges. Future policies should focus on sustainable solutions for equitable healthcare access and physicians' retention in underserved areas. This review emphasizes also the need for Europe-specific studies and further evaluation of policy effectiveness.

1. Background

Access to healthcare is a major public health issue [1], and inequalities in this area are a key challenge in many countries [2]. The existence of inequalities in access to healthcare highlights the organisational [3], health [4], social [5] and economic [6] challenges surrounding equitable access to quality care for the whole population. Then, various factors can prevent individuals from accessing healthcare when needed [7–9]. In short, these inequalities call into question the fundamental principle of horizontal equity in access to healthcare [10].

One of the factors behind inequalities in access to healthcare is territorial [11]. These are characterised by the uneven distribution of physicians across the country and by an imbalance in the geographical distribution of medical facilities [12,13]. This leads to disparities in healthcare provision, particularly in rural and disadvantaged areas [14]. These disparities have significant public health implications, as individuals in underserved areas experience worse health outcomes due to limited access to healthcare [15].

These territorial disparities in access to healthcare can be explained in two different ways. On the one hand, each region is more or less attractive for physicians [16]. Firstly, the attractiveness of an area for physicians is determined by a set of economic factors, namely the expected income and economic opportunities for the household. These depend on the supply of and demand for healthcare in the area in question [17], as well as the ability of the doctor's spouse to find a job [18]. However, the financial dimension is not the only determining factor. Working conditions, opportunities for further training and research, as well as access to new technologies and local amenities, are also central to a doctor's choice of practice location [19,20]. On the other hand, the shortage of physicians in some territories may be due to an overall shortage of these professionals, which is reflected to a greater or lesser extent in the different territories within a country [21].

To deal with territorial disparities in access to physicians, many OECD (Organisation for Economic Cooperation and Development) countries are recruiting foreign doctors [22]. Immigration is then seen as a solution to the problem of medical shortage areas because its aim is to

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re-establish equal access to healthcare across a country [23]. In fact, foreign doctors are used in particular to fill the shortage of medical staff in rural areas [24].

In order to enable this active recruitment, measures have been taken to ease the settlement of foreign doctors. This involves the introduction of specific immigration programmes to obtain visas, recognise qualifications and provide additional training where necessary [25]. For instance, many International Medical Graduates (IMGs) come to the United States under a J-1 exchange visitor program who normally require a 2-year foreign residence after the expiration of the visa. However, the Conrad 30 waiver program permits to bypass this constraint if the IMGs work for 3 or more years in a healthcare facility within a Health Professional Shortage Area (HPSA), a Medically Underserved Area (MUA) or a Medically Underserved Population (MUP) area [26–29]. The clear aim is then to increase the supply of care in underserved areas [30]. Moreover, in Australia, to receive a Medicare provider number, Section 19 AB of the Health Insurance Act (or “10-year moratorium”) stipulates that Foreign Graduates of an Accredited Medical school (FGAMs: “Graduates who received their primary medical qualification from an accredited medical school in Australia or New Zealand, and were not a permanent resident or citizen of either Australia or New Zealand at the time of enrolment.” [31]) and Overseas Trained Doctors (OTD) have to work for an up to 10-year period in a Distribution Priority Area (DPA) for General Practitioners (GPs) or a District of Workforce Shortage (DWS) for specialists [32–34] with the aim to “make sure people have access to the health care they need, regardless of where they live” [35]. There are also general immigration policies that take physicians into account. Indeed, in Canada, Provincial Nominee Immigration Programs focus on international skilled workers recruitment, by giving them permanence residence, to meet local labour market needs. These policies are decentralized to more directly address geographical inequalities, including, but not limited to, those related to healthcare supply [36]. Similarly, in New Zealand, IMGs are recruited as part of the Long-Term Skill Shortage List, which also aims to attract skilled workers for professions that are in short supply in the country [37–39]. In both these countries, there are also specific programmes designed to attract physicians to rural and underserved areas through educational programmes or financial incentives but generally they are not only dedicated to IMGs [40–42].

In summary, there are two approaches to this issue. Either a country incorporates a coercive dimension into its physician immigration policy to ensure that IMGs work in rural or underserved areas for at least a certain period of time (as is the case in the United States and Australia), or it does not favour this coercive dimension and prefers incentives to make these areas attractive (such as Canada and New Zealand). Furthermore, the challenges associated with cultural, linguistic and social integration are also central and require appropriate support to assist foreign physicians in their professional adaptation [31].

While this is the stated aim, it is worth asking whether it really works. Indeed, the immigration of physicians is useful in itself for increasing the healthcare supply. However, if this supply is not directed towards underserved areas, an increase in the number of physicians will not reduce territorial inequalities in access to healthcare. In other words, if the immigration of physicians is to reduce territorial inequalities in access to healthcare, it must increase the physician’s supply in underserved areas. It therefore seems appropriate to determine whether the use of foreign physicians is really a solution to remedy this shortage of doctors in medically underserved areas. In other words, we aimed to determine whether foreign physicians are more likely to be found in rural and underserved areas compared to non-immigrant physicians, reflecting the effectiveness of these policies in addressing shortages in these regions and then reducing territorial disparities in access to physicians. To answer this research question, we carried out a systematic review of the literature. In the following section, we describe the methodology used. We then present the results. Finally, we discuss them.

2. Methods

This systematic review was carried out in February 2024 according to the PRISMA 2020 principles [43]. To be eligible for inclusion in our study, each article had to meet all the inclusion criteria corresponding to our research question. To do this, we used the PICO standard (Population, Intervention, Comparison, Outcome), whose elements are presented in Table 1. Thus, in order for a study to be included in our qualitative synthesis, its population had to be physicians, some of whom had graduated abroad. The study also had to be conducted in a developed country (North America, Europe, Israel, Australia, New Zealand, South Korea and Japan). It also had to study this population in such a way as to assess the ability of medical immigration policies to improve access to healthcare in rural areas and/or medical underserved areas. In addition, the inclusion of an article implied that it presented a quantitative result comparing the presence of immigrant and national doctors in underserved areas (medical underserved area or rurality). We selected articles published in English since 2000. Within each study, this therefore constituted our result of interest. We therefore excluded references that did not meet these criteria. In particular, among the studies excluded were those dealing with migrant populations not specifically belonging to the medical professions, and those studying immigration policies in general. We also excluded references that did not compare the presence of Foreign-Born Medical Graduates (FBMGs) and National-Born Medical Graduates (NBMGs) or International Medical Graduates (IMGs) versus National Medical Graduates (NMGs) in medical shortage areas and/or rural areas. Articles dealing with migrants’ access to healthcare were also excluded, such as articles about medical students.

During our research for this literature review, we chose to use two search engines: PubMed and Scopus. These two platforms offer distinct advantages for our subject. Thanks to its broad coverage of the medical field, PubMed gave us access to a wide variety of publications dealing with epidemiological and political aspects of the distribution of physicians and access to healthcare. Scopus offered a broader scope by including articles from the humanities and social sciences in addition to health sciences. This diversity of disciplines makes it possible to explore aspects that complement the medical dimensions, particularly as regards the sociological, economic and political aspects of territorial disparities in access to healthcare. The joint use of PubMed and Scopus has enabled us to take account of the many facets of this complex issue.

We then developed search equations to select all the articles relevant to our subject (Supplementary Material – Table A1). To do this, we identified the most commonly used terms, grouped into several themes: physicians, immigration and medical shortage areas. In addition, as previously indicated, the decision to focus on developed countries led us to include a dedicated block for this list of countries. We then refined our equations by adding a number of expressions that were excluded on the

Table 1
Inclusion and exclusion criteria.

Inclusion	Exclusion
Population Physicians in the selected countries (Europe, North America, Israel, Japan, South Korea, Australia, New Zealand) with foreign qualifications.	Migrant population in general or in other countries.
Intervention Primary quantitative study about the distribution of medical workforce and considering the migration status.	General immigration policy.
Comparison Migrant physicians versus non-migrant physicians.	No comparison between the two groups.
Outcome Healthcare provision in rural areas or medical shortage areas.	Migrants’ access to healthcare.

basis of the initial results we obtained and that corresponded to our exclusion criteria. This methodological approach enabled us to target our search effectively and identify the most relevant articles for our study on the use of immigration of physicians as a strategy for addressing medically underserved areas, focusing specifically on developed countries.

Based on the inclusion criteria and our search equations, we selected the references using the PicoPortal online tool. The selection was first made on the basis of titles and abstracts, then on full texts, systematically by two independent reviewers. Conflicts were resolved by consensus between reviewers. We extracted data from the final sample of references. This data collection was carried out individually and without automation. It is this data collection that constitutes our results. In other words, our interest variable was the proportion of IMGs or FBMGs in rural or underserved areas, compared with urban areas or well served areas or NMGs or NBMGs. For the quality assessment checklist, it was made independently, using JBI's critical appraisal tools for prevalence and incidence studies [44].

3. Results

3.1. Flow diagram

We identified 1082 references using our search equations, 259 from PubMed and 823 from Scopus (Fig. 1). Initially, the PicoPortal platform excluded all duplicate articles, leaving 853 articles. Using this initial database, we carried out a pre-selection based on the title and abstract of

each article. Following this pre-selection, we excluded 762 articles. After this exclusion stage, we retained 91 articles for our literature review. Following this stage, we undertook a full-text review. However, 14 articles were not available and 3 others were not written in English. Following this selection, we obtained 15 results relevant to our literature review. All information about them is available in the Supplementary Material (Table A2).

All of these articles were from English-speaking countries, with 10 papers relating to the United States [24,45–53], 2 to Canada [54,55], 2 to Australia [56,57] and 1 to New Zealand [58]. Regarding publication dates, 3 articles were published between 2000 and 2004 [24,45,46], 5 between 2005 and 2009 [47–50,55], 4 between 2010 and 2014 [51,52,54,58], 2 between 2015 and 2019 [56,57] and 1 between 2020 and 2024 [53]. On data sources, 10 articles used administrative data [24,45,47–52,54,58] and the other 5 survey data [46,53,55–57]. With regard to statistical methods, 11 articles used univariate analyses [24,47–49,51–56,58], 2 used multivariate analyses [46,57] and the last 2 used indices specific to their studies [45,50]. Concerning the geographical scale, 13 studies focused on a country in general [24,45,47–54,56–58], compared with 2 articles on specific territories within these countries [46,55]. Similarly, 11 papers analysed rural areas [45–47,50–52,54–58] and 4 focused more specifically on underserved areas [24,48,49,53]. 10 papers focused on physicians [24,45–50,56–58], 4 on selected specialties [51,52,54,55] and one on healthcare professionals in general, including specific results about physicians [53]. Finally, on the question of how to distinguish migrant physicians, 12 studies focus on IMGs [45,47–52,54–58] while the other 3 distinguish FBMGs [24,46,53].

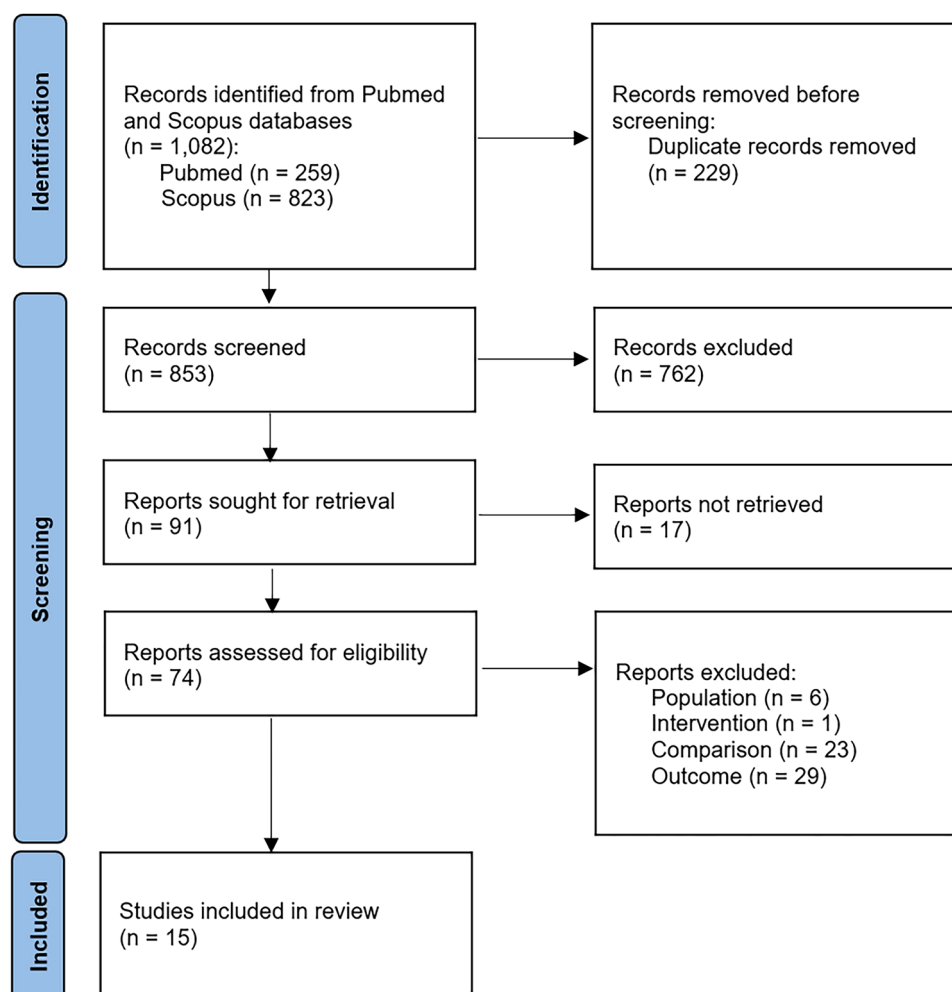


Fig. 1. PRISMA 2020 flow diagram.

3.2. Critical appraisal

Specific details of the critical appraisal are presented in the Supplementary material (Table A3). For all 15 articles, the scores ranged from 3 'Yes' out of 9 criteria to 9/9, with an average score of 7.333/9. Overall, the articles meet the criteria recommended by the JBI's critical appraisal tools for prevalence and incidence studies. However, two studies obtained less than 5 'Yes' out of the 9 criteria [46,55]. We chose not to exclude any study based on the critical appraisal results (as there is no majority of 'No' responses), but we exercise caution regarding the results from these two specific studies. Additionally, while most criteria were met by a majority of the articles, only 6 adequately addressed question 4 ("Were the study subjects and the setting described in detail?").

3.3. Summary of findings

3.3.1. United States

In the case of the United States, the available results range from the 1980s to the 2010s. In 1981, 14.9% of United States Medical Graduates (USMGs) and 11.7% of IMGs practiced in rural areas [48]. In 1997, there was a disproportion of USMGs (at 1.4%) for the United States as a whole, but in 20 states, there was a significant disproportion of IMGs. This was particularly the case in Montana, North and South Dakota, and Kentucky [45]. In 2001, 13.8% of USMGs and 10.5% of IMGs practiced in rural areas. However, among rural physicians, IMGs were more likely to work in HPSAs than USMGs (84% vs 73.7% in 2001) [48]. This overall over-representation of USMGs in rural areas also varied from state to state. In 2002, in large rural areas, there were relatively significantly more IMGs than USMGs in 9 states (Wyoming, New Mexico, Iowa, Alabama, North Carolina, Pennsylvania, Indiana, Maryland and California), in 6 states for rural areas (Maine, Delaware, Kentucky, South Carolina, Oklahoma and Alabama), and in 13 states for isolated rural areas (Montana, North Dakota, South Dakota, Vermont, Nebraska, Kansas, Minnesota, West Virginia, Kentucky, Alabama, Tennessee, Georgia and Florida) [50].

Furthermore, in 2005, there were 19.1 IMGs per 100,000 inhabitants in urban areas compared with 10.6 in all rural areas and 6.1 in isolated rural areas. For USMGs, these densities were 47.5, 38.6, and 24.3 respectively [52]. The density ratios between rural and urban areas were therefore 3.13 for IMGs and 1.95 for USMGs, implying a stronger spatial disparity of distribution for IMGs. Even more recently, between 2010 and 2018, 67.1% of US-born physicians lived in underserved medical areas compared with 66.2% of foreign-born physicians who had been residents in the US for less than 10 years ($p = 0.37$) and 57.4% of their counterparts who had been residents for more than 10 years ($p < 0.001$) [53].

There are also studies of more specific cases. For instance, for family doctors in 2000, the odds ratio for practice in a Rural Underserved Area (RUA) for foreign born-IMGs (FB-IMGs) compared with USMGs was 0.63 ($p < 0.01$). This suggests that FB-IMGs were less likely to work in these areas [24]. Furthermore, in Florida, data from 2001 showed that 48.8% of rural doctors were FBMGs, compared with 30.7% in suburban areas (difference with rural areas: $p < 0.01$) and 39.5% in urban areas (no significant difference with rural areas). In addition, FBMGs were more likely to work in rural areas than their US-born counterparts (OR=1.85; 95% CI: [1.3;1.9]) [46].

It also includes two studies on specific groups of immigrants. The first concerns Lebanese Medical Graduates (LMGs), using data from 1978 to 2004. LMGs were significantly more urban than USMGs (90.1% vs 88%, $p = 0.009$) and less rural (4.2% vs 6.8% for large rural areas, 1.8% vs 2.2% for small rural areas, 0.5% vs 0.8% for isolated rural areas) [47]. The second study concerns Canadian Medical Graduates (CMGs). Between 2004 and 2006, CMGs were more likely than USMGs to practice in rural areas (12.6% vs 10.1%, $p < 0.001$) and in partially HPSA counties (72.3% vs 67%, $p < 0.001$). However, CMGs were less likely than USMGs to work in fully HPSA counties (10.7% vs 11.2%, $p < 0.001$)

[49].

3.3.2. Canada

As a decentralised country, Canada also showed disparities in the distribution of CMGs and IMGs. A study of rural family doctors found, for data from 2000 to 2011, that overall there were more IMGs than CMGs practising as family doctors in rural areas, with 20% of IMGs compared with 16% of CMGs in 2000 and 16% of IMGs compared with 14% of CMGs in 2011 [54]. However, this result does not apply to New Brunswick, Quebec, Nova Scotia and Ontario, where this disproportion was reversed. In the case of Ontario, another study showed that in addition to inter-provincial disparities, there was also intra-provincial disparities. In fact, 2004 data on family doctors working in south-western Ontario (i.e., the 10 counties including and surrounding London, Ont.) indicate that 45.9% of CMGs and 52.9% of IMGs ($p = 0.048$) worked in small towns and isolated rural communities [55]. This corresponds to an inverse disproportion compared to the result previously indicated for all of Ontario.

3.3.3. Australia

In Australia, more recent studies have been carried out than in Canada. Using survey data from 2008 to 2013, the first article shows that among rural GPs and specialists, IMGs were over-represented compared with Australian Medical Graduates (AMGs) in towns with fewer than 50,000 inhabitants, with 36–38% vs 22% for GPs and 38% vs 27–29% for specialists respectively [56]. With more recent data (2012–2017), the authors of another study show that there was no significant difference in the propensity to work as a rural doctor between AMGs and FGAMs (OR=0.98; 95% CI: [0.77;1.13]), but FGAMs were less likely to do so than OTDs (OR=0.48; 95% CI: [0.38;0.59]) [57].

3.3.4. New Zealand

Finally, for New Zealand, an article based on the registry of physicians from 2000 to 2008 shows that 79.1% of New Zealand Medical Graduates (NZGMs) were located in major urban areas, compared with 66.2% of physicians trained in developed/English-speaking countries and 72.2% of physicians trained in other countries [58]. In rural areas, there were 9.2% of NZGMs, 15.6% of doctors trained in developed/English-speaking countries, and 12.2% of doctors trained elsewhere ($p < 0.001$). Therefore, there was an under-representation of NZMGs in rural areas compared to IMGs. This was also the case for GPs, whose proportion working in rural areas was 16.4% for NZMGs, 28.2% for doctors trained in developed/English-speaking countries, and 18.7% for doctors trained elsewhere ($p < 0.001$).

4. Discussion

As a general interpretation on the results, we can observe that the distribution of medical graduates in rural versus urban areas varies significantly across different countries. In the United States, USMGs were generally more represented in rural areas than IMGs, but these trends heavily depend on the state. However, IMGs were more likely to work in HPSAs. These results align with the analyses of Ramesh et al., indicating that the recruitment of IMGs within HPSAs is benefiting rural areas less and less [30]. Rural HPSAs are therefore somewhat disadvantaged by these IMG recruitment policies compared to urban HPSAs. This seems to explain the different results about rural areas compared to the other countries of the study. In Canada, IMGs were more prevalent in rural areas than CMGs, though this varied by province. These contrasting results do not contradict the fact that Canada does not require IMGs to work in rural and/or underserved areas for a given period of time, nor that the incentives for setting up in these areas are not specifically aimed at IMGs. In Australia, IMGs were found to be more common than AMGs in smaller towns. From the point of view of the presence of IMGs in rural areas at a given time, the coercive migration policy applied by Australia appears to be effective. In New Zealand, NZMGs were under-represented

in rural areas compared to IMGs, who had a higher presence both in general and among GPs in rural settings. Migration policy to attract skilled workers and incentives to settle in rural areas therefore also seem to be effective in attracting IMGs to New Zealand's rural areas. These findings underscore the diverse trends and challenges in the geographic distribution of physicians across different nations.

These elements have different main policy implications. Firstly, it is complex to compare the effectiveness of coercive and incentive policies for the installation of IMGs in rural or underserved areas. The Canadian example seems to indicate that when there is no federal policy (or national policy in other cases) specifically dedicated to the installation of IMGs in rural areas, then the results would be more contrasted than when there is one (as is the case in the United States and Australia). However, New Zealand is not in line with the Canadian results. Furthermore, the Canadian results may be explained by the fact that strategies other than the recruitment of IMGs have been favoured to address the issue of medical shortage areas. In fact, the deployment of IMGs is only one strategy among others. Attracting physicians to rural or underserved areas can be achieved through financial incentives, exposure to rural practice or mentoring for rural doctors [23]. However, there have been relatively few evaluations of all these interventions [59].

Secondly, dependence on foreign physicians highlights the lack of self-sufficiency in dealing with medical shortage areas. The objective of self-sufficiency, particularly in rural areas, is based on the implementation of policies aimed at increasing the number of physicians, improving working conditions in rural areas, selecting students from rural areas and giving general medicine a more prominent place in university curricula. In addition, rural planning of the medical workforce is necessary to achieve this policy objective. Indeed, the withdrawal of foreign doctors would have a direct impact on access to healthcare, especially in areas that are highly dependent on them, such as some rural areas that remain very unattractive [56].

Thirdly, the long-term effectiveness of this policy is compromised by the persistent challenges surrounding the retention of foreign physicians in rural areas [50]. Various papers have shown that IMGs tend to be more mobile and, in particular, tend to stay less in rural areas. For instance, in the province of Newfoundland and Labrador (Canada) in 2004, the median retention rate for IMGs was 22 months, compared with 39 months for doctors graduated in this region [60]. In Nebraska (US) between 1996 and 2002, the propensity to leave rural areas was higher for practitioners who benefited from the Conrad 30 program than for those who benefited from the state loan repayment program [29]. The same was true in Australia in 2008, where IMGs who were restricted in their location tended to be more mobile [61]. Satisfaction with their professional life and lifestyle is essential if they are to remain in rural areas [62], which is not necessarily the case, especially in political frameworks that coerce the location of IMGs, as is the case in Australia [31]. Integrating foreign doctors and their families into rural communities is also difficult [29,63], as are working conditions [63,64]. Therefore, the effectiveness of this policy in solving the problem of medical shortage areas remains uncertain, unless the factors affecting the satisfaction of foreign doctors are addressed through appropriate policies, especially by targeted support and incentives programmes [23, 59,63,65–67]. In other words, because IMGs face specific integration problems, measures are needed to ensure that they are maintained in rural areas [23]. There is however a relative lack of evidence about the effectiveness of these programmes on long-term retention [34,59,68].

Fourthly, the use of foreign physicians to reduce territorial disparities in access to healthcare in developed countries is controversial at international level, particularly as this immigration is often detrimental to developing countries, and is referred to as a brain drain [69]. This phenomenon mainly affects African and South-East Asian countries [70]. In developing countries, the lack of infrastructure, unattractive salaries, job uncertainty, difficult living conditions and the decline in health services are all factors that drive physicians to emigrate [71]. In

developed countries, higher salaries, growing demand for physicians, better living conditions and efficient healthcare systems encourage physicians to emigrate [69]. In addition, the brain drain phenomenon contributes to weakening already fragile healthcare systems and exacerbates the shortage of physicians in underserved areas of these countries [69]. The brain drain is therefore one of the causes of inequalities in access to healthcare worldwide. It is essential to take account of ethical concerns regarding responsibility for global health and to call for fair practices in the recruitment of these doctors [70].

However, the evidence included in the review has some limitations. First of all, there are gaps in the geographical representativeness of the studies, none of which focus on Europe. Another review, about medical deserts, find also very few studies in Europe compared to North America and Oceania [72]. This is an important issue, with doctors from Eastern and Central Europe going to work in Western and Northern Europe [73–75]. An in-depth analysis of the factors influencing foreign doctors' choice of practice in rural or underserved areas of Europe would be essential if we want to understand the dynamics specific to this region. In addition, particular attention should be paid to how physician recruitment and retention policies differ in Europe compared to the other regions studied. Understanding these differences could provide crucial information for developing effective strategies to ensure an equitable distribution of physicians across Europe. This would in turn inform public health policies aimed at ensuring quality care for all European citizens, regardless of where they live. It should also be noted that some studies use as their geographical unit a measure that does not fit in with the policy tools used in this context. For instance, in the United States, the Conrad 30 program focuses on HPSAs. It therefore seems less relevant to measure the presence of IMGs in rural areas because not all rural areas are HPSAs and not all HPSAs are in rural areas. This issue also highlights the fact that there are different types of rurality, which is a complex concept that varies according to context [76,77]. The literature could therefore use more complex typologies rather than dichotomous oppositions. Furthermore, the articles introduced do not constitute evaluations of public policy as this is usually understood. In this sense, these articles do not allow us to determine clearly the effectiveness of policies aimed at attracting FBMGs or IMGs to rural or underserved areas. While we may know whether there are more or fewer IMGs in some areas and consider the involved policies, in the end we don't measure exactly their effects. In particular, when policies are decentralised, as in the United States or in Canada, it would be relevant to analyse why in some states there are more FBMGs or IMGs in rural or underserved areas than in others. It would therefore be useful to set up studies that could be based on difference-in-differences [78] or regressions discontinuity designs [79]. Indeed, this would be particularly appropriate in the context of decentralised policies.

This review has limitations too. In fact, our systematic review only includes articles in English and does not include grey literature. This may be the reason for the lack of studies we found in Europe. It is possible that there are studies that meet our inclusion criteria but that are written in non-English languages and that do not appear in academic journals. Moreover, it focuses mainly on the effectiveness of the use of FBMGs or IMGs in dealing with territorial disparities in access to healthcare. However, it does not directly address issues relating to the retention of foreign physicians in rural or remote areas. Nor does our results address the question of the strengths and weaknesses of using foreign doctors to tackle medical shortage areas as a whole.

5. Conclusion

In conclusion, this systematic review has allowed us to determine that the over-representation of FBMGs or IMGs in rural or underserved areas is not universal, but in countries with specific policies dedicated to attract IMGs in rural or underserved areas, it seems to work on the short term but not really on the long term because of retention issues. Retaining physicians in medical shortage areas means making these

areas attractive in the long term, rather than forcing physicians to stay there in the short and medium term. Politically, this means implementing education, awareness and support programmes (financial and non-financial) for rural practice [80]. Moreover, the current state of knowledge does not allow us to formally determine the effectiveness of these foreign doctor recruitment policies in fighting medical shortage areas because of the designs of the studies. Evaluations of public policy in this regard present a scientific perspective. This could thus enable, when applied across different contexts, the establishment of international benchmarking in the fight against medical shortage areas. It could also help determine whether immigration policies are more or less effective or efficient than other measures for overcoming medical shortage areas.

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CRediT authorship contribution statement

Loup Beduchaud: Writing – original draft, Software, Investigation, Formal analysis, Data curation, Conceptualization. **Enoa Celingant:** Writing – original draft, Software, Investigation, Formal analysis, Data curation, Conceptualization. **Clara Faure:** Writing – original draft, Software, Investigation, Formal analysis, Data curation, Conceptualization. **Mathilda Meunier:** Writing – original draft, Software, Investigation, Formal analysis, Data curation, Conceptualization. **Iñaki Blanco-Cazeaux:** Writing – review & editing, Validation, Supervision, Software, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare no competing interests.

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Supplementary materials

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