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REVIEW ARTICLE

A critical review of interventions to redress the inequitable distribution of healthcare professionals to rural and remote areas

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ABSTRACT

Introduction: The shortage of healthcare professionals in rural communities is a global problem that poses a serious challenge to equitable healthcare delivery. Both developed and developing countries report geographically skewed distributions of healthcare professionals, favouring urban and wealthy areas, despite the fact that people in rural communities experience more health related problems. This review provides a comprehensive overview of the most important studies addressing the recruitment and retention of doctors to rural and remote areas.

Methods: A comprehensive search of the English literature was conducted using the National Library of Medicine's (PubMed) database and the keywords '(rural OR remote) AND (recruitment OR retention)' on 3 July 2008. In total, 1261 references were identified and screened; all primary studies that reported the outcome of an actual intervention and all relevant review articles were

selected. Due to the paucity of prospective primary intervention studies, retrospective observational studies and questionnaire-driven surveys were included as well. The search was extended by scrutinizing the references of selected articles to identify additional studies that may have been missed. In total, 110 articles were included.

Results: In order to provide a comprehensive overview in a clear and user-friendly fashion, the available evidence was classified into five intervention categories: Selection, Education, Coercion, Incentives and Support - and the strength of the available evidence was rated as convincing, strong, moderate, weak or absent. The main definitions used to define 'rural and/or remote' in the articles reviewed are summarized, before the evidence in support of each of the five intervention categories is reflected in detail.

Conclusion: We argue for the formulation of universal definitions to assist study comparison and future collaborative research. Although coercive strategies address short-term recruitment needs, little evidence supports their long-term positive impact. Current evidence only supports the implementation of well-defined selection and education policies, although incentive and support schemes may have value. There remains an urgent need to evaluate the impact of untested interventions in a scientifically rigorous fashion in order to identify winning strategies for guiding future practice and policy.

Key words: equity, health professionals, inequitable distribution, interventions, recruitment, retention, rural doctors.

Introduction

The shortage of healthcare professionals in rural communities remains an intractable problem that poses a serious challenge to equitable healthcare delivery[1]. Both developed and developing countries report geographically skewed distributions of healthcare professionals, favouring urban and wealthier areas[2-6]. Rural communities are on average sicker, poorer and less well educated; they also have worse access to health care than people in urban areas. This discrepancy between health needs and service provision is captured by Hart's 'inverse care law', which states that those with the greatest health needs usually have the worst access to healthcare services[7]. Rapid urbanization is a global phenomenon but it poses particular problems in developing countries with poor infrastructure development; improved access to healthcare is often cited as one of the driving forces[8].

A systematic review performed by the Cochrane Effective Practice and Organization of Care (EPOC) group aimed to evaluate critically the impact of various strategies aimed at reducing the rural-urban mismatch. Formal Cochrane reviews usually only include randomized control trials (RCTs) but, because no RCTs could be identified, review criteria were adjusted to include quasi-randomized studies, controlled before and after studies and interrupted time-series studies[9-10]. Despite using less stringent inclusion criteria, very few scientifically rigorous intervention studies were identified, which highlights the need for high quality research in this area.

At the same time, there is an urgent need to communicate the strength of the existing evidence to policy-makers and health educators in an effective and user-friendly manner. The aim of this review was to provide a comprehensive overview of the existing evidence, including studies that failed to meet requirements for inclusion in the Cochrane review, regarding the efficacy of various strategies to recruit healthcare professionals to, and retain them in rural communities. We attempted to critically assess the available evidence and summarize it in an easily accessible, user-friendly format.

Methods

A comprehensive search of the English literature was conducted using the National Library of Medicine's (PubMed) database and the keywords '(rural OR remote)

AND (recruitment OR retention)' on 3 July 2008, yielding 1261 references. All titles and/or abstracts were screened to identify original studies that reported the outcome of an actual intervention. The search was extended by scrutinizing the references of selected articles. Relevant review articles were also screened to identify articles that may have been missed using the original search criteria. Due to the paucity of prospective primary intervention studies, retrospective observational studies and questionnaire-driven surveys were also included. In total, 110 articles were included.

In order to provide a comprehensive overview in a clear and user friendly fashion, we classified the available evidence into five intervention categories: Selection, Education, Coercion, Incentives and Support. For purposes of this review, these terms were defined as follows:

- Selection: focus on criteria used to select students into health profession training programs based on various factors that may increase the likelihood of retaining their services in rural and remote areas once qualified. Selection criteria evaluated include geographic origin, ethnicity, gender, career intent and service orientation.
- Education: focus on strategies that optimize medical training programs (pre-vocational and post-vocational) in such a way as to stimulate interest and participation in community-based medicine (including rural practice).
- Coercion: focus on the use of authoritarian methods (by medical councils, professional bodies and/or governments) to force health professionals into rural practice.
- Incentives: focus on the provision of financial incentives or bursary schemes that are linked to rural service agreements.
- Support: focus on different ways to support the health professional while practising in rural locations.

Table 1 provides a detailed description of the categories and sub-categories used. Studies that reported on multiple variables were considered in all the relevant categories.

Specific definitions of 'rural' and/or 'remote' were not formulated and we accepted the range of definitions found in the literature reviewed. Table 2 summarizes the diversity of definitions utilized, which reflects the need to develop universal definitions that will facilitate study comparison and research collaboration. Definitions were selected from various manuscripts, including a review by Muula that emphasized the absence of universal definitions[11]. Recruitment was defined as the attraction of healthcare professionals to, and their installation in, rural settings. Retention was defined as a stay (or intended stay when questioned) of more than 5 years in total or more than 2 years beyond the termination of service agreement requirements.

In order to convey the strength of the existing evidence in a user-friendly fashion, a simple grading system was developed that utilized five categories: convincing, strong, moderate, weak and absent. Prospective RCTs were regarded as convincing evidence but, as mentioned, the recent Cochrane Review[9] failed to identify any RCTs. Therefore, in the absence of prospective studies with sufficiently rigorous methodology, none of the evidence discussed in this review was rated as convincing. A strong rating was defined as 'consistent findings from multiple studies (retrospective and/or prospective) performed in various settings, where the independent effect of the particular variable was confirmed through multivariate analysis'. Moderate was defined as 'consistent qualitative and/or quantitative findings from multiple studies and in various settings, but without multivariate analysis'. Weak was defined as 'qualitative and/or quantitative findings that were inconsistent across studies or only reported in a single study'. Absent was defined as 'no evidence meeting any of the set criteria'.

Table 1: Classification of interventions aimed at reducing the inequitable distribution of medical doctors to rural areas

Classification	Description
Selection	
Geographic origin	Coming from a rural or urban setting
Ethnicity	Belonging to an 'underserved' ethnic group
Gender	Male or female
Career intent	Future career plan stated at study entry
Service orientation	Volunteer activities reported on application to medical school
Education	
Pre-vocational	
Content	Theoretical content of training curriculum
Exposure	Clinical rotation in a rural setting, rural preceptorship
Post-vocational	
Fellowships	Rural or family physician training programs
Location	Medical school located in a rural setting
Coercion	
Registration requirement	'Community service' requirement to register as a medical doctor
Pre-requisite for specialization	Rural experience required prior to further specialization
International recruitment	Limiting foreign health professional recruits to rural practice
Incentives	
Bursaries and scholarships	Providing financial study support linked to rural service agreement
Financial compensation	Paying a 'rural allowance' or providing other financial incentives
Support	
CPD	Creating optimal conditions for continued professional development
Specialist outreach	Providing regular specialist outreach services
Time-off	Providing periods of relief (weekends/ holidays/ sabbaticals)
Family and lifestyle issues	Providing flexible working schedules for female doctors, child minding, services, subsidized schooling, accommodation, recreational facilities etc.

CPD, Continuous professional development.

Table 2: Summary of definitions used to define 'rural' and/or 'remote'[12-29]

Authors [reference]/country	Definition	Variable(s) on which definition was based
Smith *et al.* (2008) [12] Australia	'Remote' medical practice:limited clinical diagnostic support and specialist services; diagnostic and management advice via telehealth; fly-in and fly-out service models	Isolation, limited support need for telehealth and/or fly-in support
Crandall & Weber (2005) [13] USA	'Rural': a community located at least 30 miles from an urban community, there are some commercial activities, and reasonable but not immediate access to health care. 'Isolated rural': an area at least 100 miles from a community of 3000 or more individuals. 'Frontier-rural': a rural area that is at least 75 miles from a community of <2000 individuals	Distance from nearest urban centre Number of people in town/village
Mueller *et al.* (2004) [14] USA	'Rural areas' are those counties not included in metropolitan statistical areas, as defined by the Office of Management and Budget.	Common nature of employment; income levels; government structures; degree of isolation
AMHP (2004) [15] USA	The Oregon Classification System 'Rural': a population between 10 and 59.9 per square mile 'Frontier': 0.5 to 9.9 inhabitants per square mile 'Remote': counties with 0.4 or less inhabitants per square mile	Number of people per square mile
Pong & Pitblado (2001) [16] Canada	'Rural isolated': Communities that are more than 400 km from a major hospital	Distance from nearest 'major' hospital

Table 2 Cont'd

Authors [reference]/country	Definition	Variable(s) on which definition was based
Statistics Canada (2001) [17]	'Rural areas' include all territory lying outside urban areas. Taken together, urban and rural areas cover all of Canada. 'Rural population' includes all population living in the rural fringes of CMAs and CAs, as well as population living in rural areas outside CMAs and CAs.	Definitions based on predetermined definitions of location outside urban areas
Magee (2000) [18] Canada	'Rurality Index'	Skills present in community; Availability of health services
GISCA (1998) [19] Australia	ARIA Accessibility/Remoteness Index of Australia	ARIA scores based on road distances from the 11 338 populated towns to 201 service centres across Australia.
Proposed by Leduc (1997) [20], Validated, Olatunde *et al.* (2007) [21] Canada	Instead of defining the term 'rural', the author proposes a General Practice Rurality Index (GPRI).	Remoteness from a basic referral centre; remoteness from an advanced referral centre; drawing population; number of GPs; number of specialists; presence of an acute care hospital
Roos *et al.* (1996) [22] Canada	'Rural remote': Rural communities that are 80-400 km, or 1-4 hours travel time in good weather, from a major regional hospital	Distance or time away from other major services
Weinert and Boik (1995) [23] USA	'Rural' defined in terms of the Montana State University Rurality Index	Distance to nearest emergency care
DPIE & DHSH (1994) [24] Australia	RRMA Rural, Remote and Metropolitan Areas Classification	A seven scale classification, of which two classes are metropolitan, three rural and two remote.
Hays *et al.* (1994) [25] Australia	'Rural': more than 80 km or 1 hour's travel time from the nearest, most frequently accessed hospital and support services; 'remote' (for comparison):more than 300 km or 3 hours' travel time from support services	Local area population; individual town population
Britt *et al.* (1993) [26] Australia	'rural' defined according to location of general practices in either metropolitan or country towns. Country towns were classified as large (population >15 000), medium (population 5 000 to 15 000) and small (population < 5000)	Age and sex of GP; whether GP was practicing alone, or in partnership; access to medical specialists and other support services; type of work done by GP; number of written prescriptions, tests and referrals
Hartlaub & Gordon (1993) [27] USA	'Rural': living and working in a non-urban population	Physician perception
CMAAP (1992) [28]	Rural communities: those with a population not exceeding 10 000 inhabitants	Size of community (number of people)
Cleland & Mushlitz (1991) [29] USA	Rurality is defined using, *inter alia*, a 'Connectedness Index'	10 Variables, including proximity to a metropolitan area; population; level of education; type of employment; family income; level of retirement; number of locally published newspapers

AMHP, Association of Maternal Health Programs; CAs, Census agglomerations; CMAs, census metropolitan areas;
CMAAP, Canadian Medical Association Advisory Panel on the Provision of Medical Services in Under-serviced Regions Canada;
GISCA, Geographic Information Systems Cooperative of Adelaide,
University of Adelaide Service Organization http://www.gisca.adelaide.edu.au/

Results

A short summary of the evidence that supports each of the intervention categories specified is provided. Table 3 provides an overview and also rates the strength of the evidence according to the definitions provided.

Selection

There is strong evidence from various countries that 'rural origin' (or rural background) is associated with rural practice[30-34]. Most studies defined rural origin as completing primary and/or secondary school education in a rural setting. In this respect, rural origin is especially linked to the decision to choose a rural community as one's first practice location[35-37]. The potential impact of selecting medical students of rural origin was quantified by Rabinowitz[38] in a longitudinal study that evaluated the impact of the Physician Shortage Area Program (PSAP) in the USA. The PSAP combined selective admission criteria with a rurally orientated educational program. On multivariate analysis, rural origin was the single variable most strongly associated with rural practice (OR 4.2, 95% confidence interval [CI] 2.8–6.3)[38]. Another strong influence that was rarely considered is the origin of the spouse. Rabinowitz[38] found that 64% of rural physicians had spouses of rural origin; in Australia, doctors whose spouses had a rural background were significantly more likely to practice in a rural setting (OR 3.14; 95% CI 1.96–5.1)[39]. A home prefecture recruiting scheme in Japan was successful in recruiting medical professionals from rural areas and retaining them as qualified professionals in medically underserved prefectures[40]. Table 4 reflects the evidence that selection according to geographic origin increases the number of graduates who practise in rural settings.

There is limited evidence that being from a minority ethnic group or an underserved population increases the likelihood of practising in a rural or underserved area. A single study that investigated underserved, inner-city populations in the USA[45] reported that Hispanic generalists established practices in areas in which the percentages of the population that were (i) below poverty level; (ii) Hispanic; (iii) Hispanic and below poverty level; and (iv) white, non-Hispanic, and below poverty level, were greater than in areas in which white, non-Hispanic primary care physicians practiced. However, ethnicity has not been associated with rural practice in any of the other studies evaluated. Men were previously reported to be more likely than women to enter rural practice[46,47], although the strength of the association was highly variable[3]. In contrast, Laven and Wilkinson[32] concluded that gender was not found to be significant in 3 of the 9 studies. Five studies found that rural GPs were more likely to be male[32]. There is thus a great need to understand gender-related differences and how this influences geographic and specialty distribution; as more women enter medicine it may have the effect of further reducing the supply of medical doctors to rural areas.

The PSAP experience demonstrated an association between initial career intent (freshmen's interest in family practice, which was one of the selection criteria) and ultimate rural practice (OR 1.8; 95% CI 1.2–2.6)[38]; however, 60% of practising rural doctors in the US reported no intent to become a generalist at the onset of their medical studies[41]. Service orientation, as demonstrated by involvement in volunteer activities reported at the time of medical school application, has been associated with a generalist career in a single report[48]. The significance of this observation and its association with eventual practice in rural and/or underserved areas has not been evaluated.

The Rural Physician Associate Program (RPAP), also in the USA, has demonstrated success in providing rural primary care physicians to the State of Minnesota[49,50]. While selection is important as a success factor in the success of RPAP, many of these students had already expressed an interest in primary care. Students were also encouraged to spend 9 months in a primary-care setting to increase their interest and relevant experience. Flinders University established the Northern Territory Clinical School in Australia and employed a local quota program[51]. This quota program has been an effective method of enlisting local students who express an interest in living and studying in the sparsely populated Northern Territory[52]. Quota students (Northern Territory resident, Aboriginal and Torres Strait Islander) undertook longer rural placements than their non-quota peers and were 10 times more likely to spend their intern year in the Northern Territory. Both these programs thus support the concept of combining selection with local training.

Table 3: Overview and rating of interventions aimed at reducing the rural-urban mismatch

Intervention	Evidence summary	Rating	Comments
Selection Geographic origin	Students with a rural origin are more likely to practice in a rural setting	Strong	Single factor most strongly associated with rural practice Attending a rural primary school seems most relevant
Ethnicity	Students from 'underserved' populations are more likely to practice in these communities	Weak	Not consistent, suggested in 1 study that evaluated underserved inner-city (not rural) areas
Gender	Men are more likely to practice rural medicine than women	Strong	More women entering medicine may worsen rural deployment May change if more accommodating conditions are created for women
Career intent	Students whose intent at study entry is to practice rural medicine are more likely to do so	Strong	This proved an independent predictor of rural practice in the PSAP[†], but 60% of US rural doctors reported no such career intent initially
Service orientation	Students who report involvement in volunteer activities are more likely to practice rural medicine	Weak	Observation at the university of North Carolina that these students are more likely to become generalists, no proof of rural practice
Training *Pre-vocational* Curriculum content	Emphasizing the theoretical importance of rural health issues influence medical students to consider rural practice	Absent	No evidence that the content of the pre-vocational curriculum influences the decision to enter rural practice
Rural exposure	Clinical rotation in a rural setting influence medical students to consider rural practice	Moderate	Actual clinical exposure (immersion) seems most important, although the perceived impact of rural rotations may be biased by self-selection
		Weak	Pre-vocational rural training, post-vocational training and medical school entry criteria favouring rural students, all are associated with an increased likelihood of being a rural GP
Post-vocational Fellowships	Rural health specialists and family physicians are more likely to practice in a rural setting Pre-vocational students from medical schools that offer generalist fellowships are more likely to become rural doctors	Strong	Results are biased by significant self-selection: No evidence that the creation/availability of these specialties actually reduces the rural–urban mismatch
		Weak	Many potential confounders, impossible to assess the strength of the evidence in the absence of multivariate analysis
Location	Students from medical schools located in rural areas are more likely to practice in a rural setting		Rural placement may only be a surrogate of various other factors, but there seems to be sufficient evidence that rural medical schools do produce more rural doctors
Coercion Registration requirement	Requiring that recently qualified doctors perform 'community service' in a rural area reduces the rural-urban mismatch	Weak	Forced 'community service' definitely addresses short term recruitment, but there is concern that it may alienate people from the profession and from long term rural practice
Prerequisite for specialization	Requiring that doctors spend a minimum number of years in a rural area in order to specialize reduces the rural-urban mismatch	Weak	Practiced in many developing countries, criticized in Indonesia for attracting the wrong 'type' of doctor to rural areas and for reducing the return on investment placed in specialized training
International recruitment	Recruiting foreign doctors, with constraints that limit them to rural practice, reduces the rural-urban mismatch	Moderate	Foreign recruitment is widely practiced, but it often initiates a domino effect in exporting countries
Incentives Bursaries and scholarships	Providing scholarships with an enforceable rural service agreement encourages rural practice	Moderate	Most of the available evidence originate from the USA. Applicability to other countries are not known, or are very limited
Financial compensation	Providing direct financial incentives encourages rural practice	Moderate	Multidimensional programs appeared to be more successful than those relying on financial incentives alone

Table 3 Cont'd

Intervention	Evidence summary	Rating	Comments
Support Continuous professional development	Providing sufficient opportunities for continuous professional development encourages rural practice	Weak	Only questionnaire-based data
Specialist outreach support	Providing relevant specialist outreach and support encourages rural practice	Weak	Obligations to ensure that these structures are in place are not met rigorously, and are not always sustainable
Time-off	Providing back-up to allow free time during holidays and weekends encourages rural practice	Weak	The little available evidence indicates a dire need for retention strategies that focus on integration of personal and professional support for rural doctors
Family and lifestyle issues	Addressing the most relevant family and lifestyle issues encourages rural practice	Weak	Implementation of support programs for lifestyles and families of health care professionals are hampered by lack of infrastructural developments, *inter alia*, in rural areas

†PSAP, Physician Shortage Area Program, Thomas Jefferson University, http://www.tju.edu/psap/

Table 4: Evidence that selection according to geographic origin may reduce the rural-urban mismatch[31,33,38,41-44]

Study [reference]†	Where	Study population	Study design	Key findings	Comments / limitations
Rolfe *et al.* [42] Aust NZ J Med 1995	Country-wide Australia	149 (36 rural)	Cross-sectional mail survey	Rural doctors more likely to have rural background (OR 2.5)	No multivariate analysis
Fryer *et al.* [43] Fam Med 1997	Colorado USA	159 (45 rural)	Cross-sectional mail survey	Rural doctors more likely to have rural background (OR 2.7)	No multivariate analysis
Rabinowitz *et al.*[38] J Rural Health 1999	Pennsylvania USA	1609 (206 rural)	Cross-sectional mail survey plus secondary data analysis	Rural doctors more likely to have rural background (OR 3.9)	No multivariate analysis
Easterbrook *et al.* [33] Can Med Ass J 1999	Ontario Canada	159 (45 rural)	Cross-sectional mail survey	Rural doctors more likely to have rural background (OR 2.5)	Multivariate analysis
Wilkinson *et al.* [44] Med J Aust 2000	Southern Australia	504 (268 rural)	Two cross-sectional mail surveys	Rural doctors more likely to have rural background (OR 2.4)	Multivariate analysis
Rabinowitz *et al* [41] JAMA 2001	Pennsylvania USA	3365 (187 rural)	Retrospective cohort study	Rural doctors more likely to have rural background (OR 3.5)	Multivariate analysis
De Vries and Reid[31] S Afr Med J 2003	Country wide South Africa	278 (138 rural)	Cross-sectional mail survey	Rural doctors more likely to have rural background (46% vs 13%)	No multivariate analysis

†Published in peer reviewed journals after 1990.

Education

It is generally accepted that the tertiary hospital-based model of medical education exposes students mainly (even exclusively) to curative and specialized care, reducing the likelihood of a future generalist career and rural practice. Curricular content and clinical exposure may influence the career choice of graduate and post-graduate students, but few prospective studies have evaluated the influence exercised by medical education. Retrospective questionnaire-driven surveys indicate that theoretical course content had very little influence on the decision of rural doctors to enter rural practice[31]. Rural field residencies (immersion) together with adequate local guidance and supervision (preceptorship) seem to exercise the greatest influence[53-56]. It is extremely difficult to evaluate the independent contribution of rural field residencies, because these rotations are usually optional, which introduces considerable selection bias. Data from one medical school in Thailand indicated the majority of graduates continued in rural practice after completing a compulsory rural residency, using the immersion model[57]. Retrospective surveys conducted among rural doctors in

other countries also support the value of pre-graduate rural exposure and the need to be equipped with the necessary skills to practise in a rural location[32,58].

At the post-vocational level, doctors who completed generalist fellowships, such as family medicine or a rural health specialty, were predictably more likely to enter rural practice[59-61]. However, self-selection again introduces significant bias and there is no evidence that the availability of these generalist specialties actually recruits more doctors into rural practice. Countries such as Canada[62] and Brazil[63] have successfully adopted policies to reverse the trend towards specialization with positive results in terms of geographical deployment, but in general the restriction of specialist training has faced strong resistance from medical schools and professional associations. A survey of medical schools in the USA, titled 'Which medical schools produce rural physicians?'[64] identified the following characteristics in medical schools that were most successful in producing rural practitioners: location in a rural state, public ownership, offering generalist specialties and receiving little research funding from the National Institutes of Health (NIH). More recently, Worley et al[51] investigated the vocational career paths of graduate entry medical students of Flinders University in Australia. A comparison of rural, remote and tertiary tracks found that students who chose the 'parallel rural community curriculum' program or trained at the Northern Territory Clinical School were more likely to choose a rural career after graduation than their urban-trained counterparts.

Coercion

Forced redress, where penalties are applied if doctors do not comply with certain requirements, remain limited and controversial[65,66]. Coercive measures are often regarded as unfair, because other career professionals are rarely required to perform compulsory 'community service'. By singling out the healthcare profession, potential students may be discouraged from considering a medical career. Coercive measures can be particularly problematic for physicians and may result in a significant proportion being unable or unwilling to complete these service requirements, preventing them from entering professional practice. Problems associated with coercive measures are exacerbated by cultural and/or religious beliefs that prohibit physicians (especially women) and other medical staff from rendering much-needed health services, as discussed in articles that report the issue of gender-related problems in Pakistan[67,68]. Barley et al[69], using a 37 item survey to obtain demographic information about the background, community and practice of rural female physicians, concluded that assumptions regarding rural physicians, especially women, must be updated to assist communities in recruiting rural physicians and to assist medical schools and residencies in adequately preparing graduates for rural practice[69].

No published evidence was found that demonstrated the impact of coercive measures, such as compulsory 'community service'. Concern has been expressed that although coercive measures address short-term recruitment problems, it may worsen human resource constraints in the long term. This contradiction arises as coercive measures are usually applied to recently graduated and inexperienced doctors. Observational studies from South Africa suggests that requiring inexperienced doctors to perform 'community service' in rural areas without adequate guidance and support, may force them to practise outside their scope of competence, which undermines their confidence and leaves them open to litigation; these negative experiences often alienated junior doctors from considering rural practice as a career option[70,71].

Incentives

Table 5 reflects the evidence that scholarships or bursaries with rural return of service agreements successfully recruit and retain more rural doctors. Few studies documented the efficacy of these interventions and the reported outcomes are highly variable. For example, many service-linked scholarships, loans and loan repayment programs have been described, but the effect of these on the rural or remote workforce are not clear[72]. In addition, contracts with a public service agreement in return for state sponsored training have

been implemented in many developing countries in Latin America, Africa and South East Asia[73], but a report by the WHO concluded that, overall, these policies have had very little influence on the geographic distribution of health professionals[74]. Ensuring that return of service agreements are honoured remained a challenge in all settings, and imposing excessive penalties has been strongly opposed by medical schools and professional associations[57,75].

The experience with paying direct financial incentives, such as special rural allowances, has been variable. In Canada, the distribution of general practitioners was positively influenced by specifying raised fees in rural and underserved areas, and reduced fees in 'overserved' areas[62]. In the Philippines, rural incentives (linked to decentralization of the health service) had an unintended negative impact resulting from the fact that rural local governments were unable to hire healthcare professionals at the high salary levels specified[82]. Although remuneration issues feature prominently in questionnaire-based surveys and market theory predicts that financial incentives should help to remedy the situation, little quantitative evidence could be found to support the value of financial incentives.

More recently, incorporating both recruitment data and qualitative assessment using focus group discussions and questionnaires, Ross[76] reported on the success of a novel scholarship scheme (Friends of Mosvold Scholarship Scheme; FOMSS). Despite educational challenges, students from rural areas in South Africa were able to succeed at tertiary institutions if provided with dedicated mentoring and support. In the program rural hospital managers played an important role in the selection and support of students and assumed responsibility in partnership with the bursary scheme. Providing ongoing support to students while at university (by maintaining regular contact, encouraging peer support and facilitating constructive volunteer work) and ensuring that on graduating they are integrated into the hospital workforce, proved to be an effective recruitment strategy. Of the 24 FOMSS students who have graduated, 18 were working in the district that supported them.

Support

Questionnaire-based surveys indicate that adequate support is valued by rural health professionals[83,84]. However, optimal strategies have not been identified and there is little empiric evidence to quantify its impact. Supportive measures receive more emphasis in countries where rural doctors are state-employed, compared with countries where rural health care is provided by private practitioners. Rural doctors listed the following complaints: academic isolation, lack of consultant support, insufficient locum relief and poor physical infrastructure at hospitals[85,86]. Family and lifestyle issues included access to good schools for children, poor recreational infrastructure, inadequate accommodation facilities and limited employment opportunities for the spouse[87-89]. An example of potentially contradictory qualitative evidence was the request for improved access to consultant services, while also indicating that the 'independence' of rural work and the need to deal with varied and challenging situations is an important attraction[90].

Continuing Professional Development (CPD), formerly known as Continuing Medical Education (CME), includes all in-service training programs that supplement basic medical education and post-vocational training throughout a doctor's professional working life. Continuing professional development is a professional imperative for every doctor. Not only does it improve patient care but, if done efficiently, it also improves professional job satisfaction and may support rural recruitment and retention of doctors and other health professionals[70,91,92]. A study from Canada[93] demonstrated that practice-based learning plays an increasingly important role as regulators require physicians to participate in CPD; it is stated that research in this area should explore ways of enhancing critical self-reflection. Investment in infrastructure, equipment and buying time-out may be required to support CPD activities[94], but with the necessary commitment it is possible to identify simple and pragmatic ways to establish and maintain meaningful CPD activities in academically isolated rural hospitals[70,95].

Table 5: Evidence that scholarships/bursaries with rural return of service agreements may result in more rural health professionals[41,72,76-81]

Study [reference]†	Where	Study population	Methodology	Key findings
Thaker *et al.*[72] J Prof Nurs 2008	Selected states USA	24 programs (± 11 700 applicants)	Mixed mode and iterative approach (quantitative and qualitative methods used; and repeated across different cohorts of applicants)	Support-for-service programs are a substantial component of workforce distribution efforts, although little is known about these programs and their outcomes.
Ross[76] S Afr Med J 2007	KwaZulu Natal Sth Africa	27 rural	Focus group discussions; self-administered questionnaires	Despite educational challenges, students from rural areas are able to succeed at tertiary institutions and will return to work in rural districts. District hospitals can play an important role in the selection and support of students of rural origin.
Rosenblatt *et al.*[77] JAMA 2006	Country- wide USA	846 grantees (846 CEOs) - 1 CEO per grantee	Cross sectional survey, mailed questionnaires	CHCs face substantial challenges in recruitment of clinical staff, particularly in rural areas. Additional incentives may be needed to entice clinicians to rural areas, particularly to communities without the amenities that attract physicians and their families. One approach would be to expand programs, such as the Medicare incentive payment program, which use financial incentives as a magnet
Pathmann *et al.*[78] Med Care 2004	Country-wide USA	1157	Telephone & mailed questionnaires; data from secondary sources, including medical practitioner registers ('Masterfiles')	States' support-for-service programs bring Physicians to needy communities where a strong majority work happily and with at-risk patient populations; half stay over 8 years. Loan repayment and direct financial incentive programs demonstrate the broadest successes.
Stageman *et al.*[79] J Am Board Fam Pract 2003	State USA	39 (29 rural)	Qualitative interviews and analysis	Special consideration must address the issues of recruitment of students, integration into the basic program, licensure issues, determination of fellowship training needs, and faculty recruitment.
Mak & Plant[80] Austr J Rural Health 2001	State Australia	4	Case studies	Pre-clinical students can be valuable members of the rural health workforce.
Rabinowitz *et al.*[41] JAMA 2001	State USA	3414	Retrospective cohort study	Medical educators and policy makers can have the greatest impact on the supply and retention of rural primary care physicians by developing programs to increase the number of medical school matriculants with background and career plans that make them most likely to pursue these career goals
Duttera *et al.*[81] J Health Care Poor Underserved 2000	Georgia USA	438 (249 rural)	Retrospective cohort study and secondary data analysis	The retention rate of scholarship physicians in the post-medical fair period is impressive. The state's investment in the medical fair approach to recruitment and retention of physicians is justified.

CHC, Community health centre; CEO,: chief executive officer.
†Published in peer reviewed journals after 1990.

Discussion

Empiric evidence that supports the value of interventions to redress this inequitable distribution of healthcare professionals to rural and remote areas is limited, and huge healthcare disparities continue to present a global challenge[74]. In fact, the maldistribution of health professionals seems to be worsening in many developing countries[2,96]. The available evidence indicates that well-defined selection and education strategies hold value, which echoes the views of Strasser who stated:

> *…evidence shows that the three factors most strongly associated with entering rural practice after completing education and training are a rural upbringing, positive clinical experiences at the pre-vocational level, and specific post-vocational training for rural practice*[97].

Strategies that fall into the Incentives and Coercion categories address short-term recruitment needs, but little evidence supports their long-term impact, which may even be negative.

Qualitative research has identified numerous factors that may influence health professionals' decisions to stay in rural areas[98]; however, there is a need to conduct more rigorous quantitative studies to evaluate both the short- and long-term impact of interventions within each of the categories identified. The most important policies to consider in addressing the inequitable distribution of healthcare professionals, rated according to the strength of the available evidence, are reflected in Table 6. Government commitment to improve healthcare delivery to rural and underserved communities is essential, but policy should be guided by the best available evidence and every attempt should be made to generate rigorous evidence if novel or untested policies are adopted. The available evidence suggests that student selection, favouring rural applicants with a stated interest (or 'career intention') in general practice and a service orientation, is the strategy with the greatest likelihood of reducing the rural–urban gap. Continual research efforts that aim to determine career intent by medical graduates will add significant insight to understanding factors that may increase the likelihood of retaining their services in rural areas. Gender differences may be more pronounced in settings where female doctors have little chance of structuring their service hours to be more accommodating. In addition, the work ethos of medical professionals is changing in that many professionals would prefer to work fewer hours[99-101]. The impact of gender on future service commitments and deployment to rural and underserved communities requires further investigation, because there has been a major increase in the number of female students entering medical schools in recent years.

Another area of importance is measuring the short- and long-term impact of coercive measures. The success of scholarships or bursaries with rural return of service agreements (Table 5) is highly variable and the impact of novel bursary schemes and/or financial incentives requires further investigation[76,102,103]. Recruiting foreign doctors from countries that experience a dire shortage of doctors themselves may offer a short-term reprieve, but the ethical issues relating to foreign recruitment and forced rural deployment require further scrutiny. Similarly, the effect of intergovernmental arrangements requires careful impact evaluation to consider issues such as language, cultural barriers, experience of doctors and patients, and ethical issues. It remains important to try and identify optimal models for supplemented remuneration, but in general it appears that economic incentives alone are not enough to influence redeployment. The financial incentives issue illustrates an important point, namely that identifying reasons for dissatisfaction among rural doctors using questionnaire-based approaches may be useful to highlight problems that should be addressed, but it does not establish whether an intervention will actually improve the situation.

Table 6: Reducing the rural-urban mismatch - policy issues, implementation strategies and topics for further research

Policy level	**Policy issue**	
Government	Key determinants of success include: length of time on national priority agenda, long-term political commitment and integration of efforts with those factors of other sectors such as education and civil service.	
Medical school	Including a clear focus on issues related to the health of rural/underserved communities in the goal statement of the institution	
Strategies for implementation and further evaluation – topics ranked according to the evidence available		
Need for implementation Strong evidence	**Need for implementation and further research** Moderate evidence	**Need for more research** Weak or absent evidence
Selection policies (consider selection profile) - rural origin (rural primary/secondary school) - career intent (rural practice) - gender (male) Developing more medical schools in rural areas or developing more satellite rural campuses	Rural exposure during training Scholarships with rural service agreements Rural outreach/support	Selection on basis of ethnicity Developing optimal working models Coercive policies: community service foreign recruitment

The value of supportive interventions may be difficult to measure and it may be argued that there is an ethical obligation to provide sufficient support to rural practitioners. Nevertheless, it would be worthwhile to quantify the impact of various support strategies; in other words, to move beyond simply asking physicians why they left or what they found unsatisfactory about rural practice, to using more sophisticated qualitative and quantitative methods to measure the response to specific interventions. Greater developmental investment with improvement in basic services such as water and sanitation, electricity, roads and schools is required, especially in developing countries, because poor infrastructure is frequently quoted as a reason why people, including health professionals, leave rural areas[104].

In relation to educational support, it is difficult to determine the independent effect of locating medical schools in more rural settings, because findings would be confounded by multiple factors, such as the recruitment of more rural students or an increased likelihood that students will find a life partner of rural origin. However, identifying the exact variables that exercise the greatest independent influence seems irrelevant if the strength of the association between rural location of medical schools and ultimate rural practice is shown to be significant.

Interestingly, current evidence offers contradictory conclusions regarding the value of expert consultant support. On one hand rural doctors place great value on their independence and the challenge of coping with a variety of conditions on their own. On the other hand they express a need for improved access to and support from specialist services. Independence is a strong feature of rural practice, but it should not be promoted to the detriment of optimal patient care. More research on the interaction between consultant outreach services and rural physicians is needed to provide better guidance on how to optimize expert support services. Well structured CPD activities have demonstrated value to enhance knowledge and skill levels; significant event audits, regular peer review, group-based learning, and computer generated CPD reminders have all been shown to be effective educational strategies for general practice[105]. The impact of CPD programs in developing countries is less well described. For example, the Health Professions Council of South Africa only recently amended its CPD guidelines to encourage practical and participatory educational activities; therefore an evaluation of the impact of this policy change is not yet possible[106].

Adding to the complexity is the distortion that may be created by research initiatives and decision-makers' lack of insight. Bowman[107] contends that medical educators, deans and editors often spend most of their lives 'inside' privileged areas with high physician concentrations and lack knowledge about what is happening on the 'outside'. Thus the fact that 70-80% of rural or underserved origin candidates do not go 'outside' current concentrations of physicians and health resources allows them to ignore the fact that they go outside at rates that are between 2 and 10 times higher than the average medical student. He argues that it is difficult for those on the inside to give time and attention to, or even understand, the principles underlying distribution of physicians to underserved areas, which he summarises to be about physician origins outside, training outside, and policy supporting physician location outside current concentrations of physicians. Ultimately, closer collaboration between those inside and outside is required to perform research and inform pragmatic policy change geared to improving physician distribution.

A factor that has not been evaluated in the recruitment and retention debate is the need to define best practice models in various settings[70]. In the developed world where most of the studies were conducted, free market or state sponsored private practice is the norm, but in developing countries a major part of rural service delivery is provided by state employed doctors. In South Africa there is tension between these two models, although some 'public-private partnerships' (PPPs) have been successful in reducing this tension[108]. In addition, an 'ideal nation' model has been put forward that suggests a role for PPPs in academic medicine[109]. The development of best practice models may depend on pragmatic integration of the 'PPP-philosophy' into current healthcare platforms but, to date, no empiric evidence has been generated to guide this process.

The summary of definitions used for 'rural' and 'remote' illustrates the complexity of establishing universal definitions. There is a lack of research output and involvement in the formulation of workable definitions from developing countries, where the disparities are most pronounced and a developmental rather than a service approach to health is the norm. In other words, in developing countries health is inextricably linked to broader intersectoral issues of community development in terms of the primary healthcare approach, and the term 'rural' denotes more than just a geographic issue. Standard international definitions will assist researchers, policymakers and educators to collaborate, compare and share information more effectively[12]. This is important because the available pool of healthcare professionals represents a global asset[110].

Strikingly, the emphasis on rural and underserved communities often represents 'narrow-minded' nationalistic views regarding inequitable distributions of healthcare professionals within a single country. While it is understandable that countries struggle to find solutions for their own problems, it is disconcerting to see how little emphasis is placed on the true health inequities from a global perspective. The main inequities are not *within* countries but *between* countries. If national boundaries are disregarded in order to look at the problem of inequitable access to healthcare from a global perspective, it becomes clear that the problem of health equity is far greater than mere rural–urban (or remote–urban) discrepancies. Innovative solutions need to be found.

One innovative alternative involves the development of new cadres of healthcare workers, for example through formalization of the role of the community health worker, or training mid-level medical workers (physician assistants)[111-118]. This cadre represents an important component of health service delivery recommended by the WHO and has been incorporated into primary healthcare initiatives in both developed and developing countries[119]. Their role in promoting public health is well-established in countries with successful primary and preventive care services such as Cuba, and in the face of the growing strain that HIV/AIDS are placing on public health facilities in sub-Saharan Africa[120].

In conclusion, this review recognizes a dire need to evaluate in a scientifically rigorous fashion the impact of

interventions and policies that aim to redress the inequitable distribution of healthcare professionals to rural and remote areas. It is only with the availability of more rigorous evidence and sufficient political commitment that we will be able to address the pressing issue of equitable healthcare delivery and identify winning strategies to guide future practice and policy.

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