Annex 1: GRADE evidence profiles

Introduction to GRADE evidence profiles

As part of developing evidence-based global recommendations, these evidence profiles were developed to better understand the methodological quality and strength of the evidence. We considered all available evidence, as outlined in the methodology section. Key to understanding these evidence profiles are the following:

- There is an evidence profile prepared for each recommendation. All follow the same format and judge the quality of the evidence on the pre-defined criteria as outlined by the GRADE system, which is used by the WHO Guidelines Review Committee.
- For each recommendation, the intention is to present the highest quality evidence available for that recommendation.
- If there is particularly relevant *supporting* evidence of lower quality felt to provide key information when judging the quality and strength of evidence available, then this has been either referenced in these evidence profiles or included in the additional evidence tables in annex 2.
- For additional information on all of the studies (and the interventions they are describing) included in these evidence profiles, please cross-reference each study with those in annex 2.

GRADE criteria for assessing the quality of the evidence

Quality of the evidence	Study design
High	Randomized trial
Moderate	
Low	
Very low	Observational study

Downgrade the quality of the evidence if…
Study limitations
Inconsistency
Indirectness
Imprecision
Publication bias

Upgrade the quality of the evidence if…
Large magnitude of effect
Evidence of dose-response
All plausible confounding factors accounted for

Education evidence profiles

A1. Use targeted admission policies to enroll students with a rural background in education programmes for various health disciplines, in order to increase the likelihood of graduates choosing to practice in rural areas

Quality assessment									Summary of findings			Reference
No. of studies and study reference	Targeted cadre of health worker	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considerations	**Quality of evidence**	No. of participants/ sample size	Was there a control group?	Reported effects/outcomes	
Availability (measured as % of health workers with a rural background currently practicing in rural area)												
15	Physicians Australia, Canada, South Africa and USA,	Cohort and case control studies, retrospective descriptive study	None	None	None	None	Large magnitude of effect	Moderate	5712 students (Laven)[1] 961 students (de Vries) 92 students (Rabinowitz) 78 students (Woloshuk) Total sample size=6843	Yes	• (Laven) Rural background was associated with rural practice in 10 of 12 studies. The strength of association ranged from an odds ratio of 1.68–3.9, but in most cases was around 2–2.5. • (de Vries) It was found that 38.4% of the rural-origin graduates are currently practicing in rural areas, compared with 12.4% of urban-origin graduates practicing in rural areas (OR=3.09). • (Rabinowitz) Showing long-term retention rates and persistent effect, after 11-16 years, 68% of the physician shortage area programme graduates were still practicing family medicine in the same rural area, compared with 46% of their non-PSAP peers. • (Woloshuk) 32% of the 22 rural background students were practicing in a rural community, as were 13% of the 56 urban background students (RR=2.55; CI=1.01-6.42).	Laven 2003 De Vries 2003 Rabinowitz 2005 Woloshuk 2004
Competence												
None												
Responsiveness												
None												
Unintended effects												
None												

[1] Laven 2003 is a systematic review. Therefore, we only searched for and included all relevant studies following the publication of the Laven review.

A2. Locate health professional schools, campuses and family medicine residency programmes outside of capitals and other major cities as graduates of these schools and programmes are more likely to work in rural areas

Quality assessment									Summary of findings			Reference
No. of studies and study reference	Targeted cadre of health worker	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considerations	**Quality of evidence**	No. of participants/ sample size	Was there a control group?	Reported effects/outcomes	
Availability (measured as % of health workers graduated from rural school currently practicing in rural area; % of graduates of family medicine residency programmes in rural area now practicing in a rural area)												
1	Physicians, Democratic Republic of the Congo	Observational study	Serious: no handling of confounding (e.g., students' rural background)	None	None	None	Large magnitude of effect	Low	150 students, 2 medical schools	Yes	Location of school in a rural area was strongly associated with subsequent employment in a rural area. The strength of the association was RR=3.5 (2.4-5.1).	Longombe 2009
1	Physicians, China	Observational study	Serious: no handling of confounding (e.g., students' rural background)	None	None	None	Large magnitude of effect	Low	12 metropolitan (about 5300 students) and 10 rural medical schools (about 2500 students)	yes	All 10 rural medical schools produced rural physicians; one rural school reported that of its 256 graduates, 88 (34.4%) entered rural practice. Ten of the 12 metropolitan medical schools did not produce any rural physicians, whereas the remaining two metropolitan schools registered a total of 73 (7.6%) graduates who selected a rural practice location.	Wang 2002
1	Physicians, USA	Survey of programme directors	None	None	Serious: data relates to initial practice location; reported by programme directors	None	None	Low	353 family medicine residency programmes	yes	Family practice residency programmes that graduated more rural physicians were located in more rural states and had more required rural months. For example, for those family medicine residency programmes with 0 rural months required, 24.4% of graduates worked in rural areas, whereas for 4-6 required rural months had 51% and 22+ required rural months had 68.5% of their graduates working in rural areas.	Bowman 1998
1	Physicians, USA	Cross-sectional study	Serious: no adjustment for confounders	None	Serious: indirect outcome (practicing in rural area in New Mexico)	None	None	Very low	317 subjects	yes	Graduates from rural family medicine residencies were significantly more likely to remain in New Mexico and practice in rural areas (65.1%) than were graduates of the urban programme (25.8%; $p < .001$).	Pacheco 2005
1	Physicians, USA	Survey of programme directors	Serious: selection bias (i.e., self selection); inappropriate comparator group	None	Serious: data reported by programme directors	None	None	Very low	29 obstetrics residency programme and 9 rural fellowships programme directors	yes	More than 75% of family medicine residents who completed obstetrical and rural health fellowships are practicing in rural communities with a population of less than 25 000. Only 25 to 35% of those who complete maternal health and obstetrical fellowships are practicing in rural communities of the same population size.	Acosta 2000

A2. Locate health professional schools, campuses and family medicine residency programmes outside of capitals and other major cities as graduates of these schools and programmes are more likely to work in rural areas												
Quality assessment									**Summary of findings**			**Reference**
No. of studies and study reference	Targeted cadre of health worker	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considerations	**Quality of evidence**	No. of participants/ sample size	Was there a control group?	Reported effects/outcomes	
Availability (measured as % of health workers graduated from rural school currently practicing in rural area; % of graduates of family medicine residency programmes in rural area now practicing in a rural area)												
Competenc												
None												
Responsiveness												
None												
Unintended effects												

Education evidence profiles

A3. Expose undergraduate students of various health disciplines to rural community experiences and clinical rotations as these can have a positive influence on attracting and recruiting health workers to rural areas.												
Quality assessment									**Summary of findings**			**Reference**
No. of studies and study reference	Targeted cadre of health worker	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considerations	**Quality of evidence**	No. of participants/ sample size	Was there a control group?	Reported effects/outcomes	
Availability (measured as percentage graduates practicing in rural areas)[2]												
1	Physicians, USA	Cohort study	No adjustment for confounders	None	None	None	Large effect	Low	1131 Rural medical education program (RMED) students	yes	RR=3.5 (2.3-5.3) *Supporting evidence: 84% of RMED graduates reported that RMED was important in helping them choose a geographic location.*	Smucny 2005
Competence (measured as perception of administrators of the effect on quality of care and knowledge test scores)												
1	Physicians, USA	Survey of administrators	No adjustment for confounders	None	Very serious (indirect outcome)	None	None	Very low	11 hospital administrators	No	Administrators thought that participation in RMED was likely to help their medical staff remain up-to-date.	Smucny 2005
1	Physicians, USA	Survey of administrators	No adjustment for confounders	None	Very serious (indirect outcome)	None	None	Very low	1131 RMED	No	RMED students had significantly higher exam scores (212.3) than did non-RMED graduates (199.1).	Smucny 2005
Responsiveness												
None												
Unintended effects												
None												

RMED: Rural Medical Education Program is a 36-week clinical experience in rural communities for medical students.

[2] Supporting evidence:

Halaas (2008). No comparison group used. Supporting evidence that the nine-month longitudinal experience in a rural setting contributed to the availability of health workers in a rural area. *Of those currently in practice, 44% have practiced in a rural setting all of the time, 42% in a metropolitan setting and 14% have chosen both, with more than 50% of their time in rural practice.*

Capstick (2008). Surrogate outcome (attractiveness). Supporting evidence that a week-long exposure to rural pharmacy practice increased students' willingness to consider rural practice post graduation. *Significantly more students overall indicated postexternship that they would consider rural work than those did pre-externship (P = 0.0001). Pre-externship, 48% of students (n = 51 of 106; 95% CI, 0.39–0.58) stated they would consider rural work, increasing to 73% post-externship (n = 86 of 118; 95% CI, 0.65– 0.81). The proportion of students of rural origin (population < 100 000) indicating they would consider rural work increased from 70% (see above) to 80% (n = 33 of 41; 95% CI, 0.68–0.92) (P = 0.282). The proportion of students of urban origin (population > 100 000) indicating they would consider rural work increased significantly from 38% (see above) to 67% (n = 53 of 79; 95% CI, 0.57–0.77) (P = 0.0003; Fig. 3).*

Courtney (2002). Surrogate outcome (attractiveness). Supporting evidence that a rural clinical nursing placement increased the number of students intending to work in a rural setting. *Over half (56%) of the rural clinical placement students indicated in their pre-test responses they would seek work in a rural setting in one year's time, compared to 29% of the metropolitan placement students. This difference increased in the post-test results, with 63% of rural clinical placement students wishing to work in a rural area in one year's time and only 13% of the metropolitan placement students wanting to do so.*

Education evidence profiles

A4. Revise undergraduate and postgraduate curricula to include rural health topics so as to enhance the competencies of health professionals working in rural areas, and thereby increase their job satisfaction and retention												
Quality assessment									**Summary of findings**			**Reference**
No. of studies and study reference	Targeted cadre of health worker	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considerations	**Quality of evidence**	No. of participants/ sample size	Was there a control group?	Reported effects/outcomes	
Availability (percentage of graduates from a rural focused curricula school practicing in a rural area)												
1	Physicians, Canada	Cross-sectional study	Only captures location at one specific time-point	None	None	None	None	Low	1322 graduates	No	In 2004, 167 (12.6%) Memorial University (MUN) graduates worked in rural Canada, making up about 4.9% of the rural physicians in Canada. Eighty-one (6.1%) MUN graduates worked in Newfoundland, making up roughly 20.8% of the rural physicians in the province.	Mathews 2008
Competence (comparison of exam results between rural curriculum students and mainstream medical students)												
1	Physicians, Australia	Observational study	No adjustment for confounders	None	None	None	None	Low	14 Parallel rural community curricula (PRCC) students and 39 mainstream students	Yes	When comparing mean percentages of fifth-year exam results, students from the rural curriculum course gained better results than the urban based medical curriculum in all the following: Medical, surgery, obstetrics and gynaecology, paediatrics, psychiatry and clinical examination. PRCC students expressed greater access to patients and clinical learning opportunities than their mainstream counterparts.	Worley 2000
Responsiveness												
None												
Unintended effects												
one												

[3] Supporting evidence:
Kaye (2010). Surrogate outcome (intentions and perspectives). Supporting evidence that having community based training as part of curricula is important. *Overall, there was no marked different in motivation to seek medical career between those graduates of different curricula. However, community based training was identified as the main factor shaping the values and attitudes of those who were in favour of rural practice and were confident and willing to work in a rural area.*

A5. Design continuing education and professional development programmes that meet the needs of rural health workers and that are accessible from where they live and work, so as to support their retention												
Quality assessment									**Summary of findings**			**Reference**
No. of studies and study reference	Targeted cadre of health worker	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considerations	**Quality of evidence**	No. of participants/ sample size	Was there a control group?	Reported effects/outcomes	
Availability (measured as the reported importance of ongoing education and training to retention of primary health workers practicing in rural communities)[4]												
6	Studies on physicians, nurses, physician assistants, allied health professionals. Australia, Canada, South Africa and USA,	Observational studies - longitudinal, ethnographies, surveys, interviews etc	None	None	Poor reporting of outcomes; indirect outcomes	None	None	Very low	7200 health workers	No	Six studies looked at the importance of CPD/CPE to retention. One found no significant relationship between perceptions of supervision or of continuing education and anticipated job retention in mental health workers, although these were found to be predictors of job satisfaction; one found that a nurse leadership programme was successful in improving anticipated retention although travel difficulties resulted in a high drop-out rate of rural nurses; and another study of a new graduate nurse orientation programme found CPD/CPE successful in increasing retention. A fourth study found that an interdisciplinary educational programme for rural mental health workers improved their measured job satisfaction, though the link with turn-over was not measured.	Humphreys 2007
Competence (measured as confidence in practicing in rural area)												
32	Postgraduate health workers, HICs, MICs and LICs	RCTs and quasi-experimental	None	None	Not rural health workers	None	None	Moderate	2995 health workers	Yes	24 out of 32 studies reported significant improvement in the professional practice (in at least one major outcome measure) of those with access to continuing education meetings.	Thomson 2005[5]
1	Physicians, Australia	Survey study	None	None	Very serious (perceptions of impact of CME on confidence)	None	None	Very low	429 physicians	No	94% agree or strongly agree that access to CME contributes to confidence in practicing in rural and/or remote locations.	White 2007
None												
Unintended effects												
None												

[4] Supporting evidence:

Humphreys (2007). Surrogate outcome (relative importance of CPD/CPE with respect to other retention factors). Supporting evidence for the importance of CPD/CPE to be involved in a bundled retention strategy. *All studies (5) involving rural doctors found that other factors ranked more highly than access to CPD/CPE in decisions to remain in or leave rural practice … While CPD/CPE activities are identified as important to retention, they are usually not the most important factor. Moreover, the importance attributed to CPD/CPE varies with gender, age or stage in the life-cycle, years of experience in rural practice or profession, and other professional elements such as career pathways, mentoring, adequate orientation and peer support. A clear conclusion is that a comprehensive retention 'package' is important and each element of it must be addressed.*

[5] This is a Cochrane systematic review.

Regulatory evidence profiles

B1. Introduce and regulate enhanced scopes of practice in rural or remote areas to increase the potential for job satisfaction, thereby assisting recruitment and retention												
Quality assessment									**Summary of findings**			**Reference**
No. of studies and study reference	Targeted cadre of health worker	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considerations	**Quality of evidence**	No. of participants/ sample size	Was there a control group?	Reported effects/outcomes	
Availability												
None												
Competence (measured using health status and a number of quality of care indicators)												
6	Nurse practitioners replacing physicians, (HIC)	RCTs[6]	Some limitations	Some inconsistency	Serious (not in rural areas)	Unclear	None	Low to moderate	Not reported	yes	"Quality of care was in some ways better for nurse practitioner consultations."	Horrocks 2002[7]
Responsiveness (measured as patient satisfaction)												
5	Nurse practitioners replacing physicians, HIC	RCTs	None	Some inconsistency	Serious (not in rural areas)	Serious (CI includes both no effect and significant benefit)	None	Low	3890	yes	Patients were more satisfied with care by a nurse practitioner (standardized mean difference 0.27, 95% confidence interval 0.07 to 0.47). No differences in health status were found.	Horrocks 2002
Unintended effects												
None												

[6] Randomized Control Trials

[7] Horrocks is a systematic review.

B2. Introduce different types of health workers with appropriate training and regulation for rural practice in order to increase the number of health workers practicing in rural and remote areas

Quality assessment									Summary of findings			Reference
No. of studies and study reference	Targeted cadre of health worker	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considerations	**Quality of evidence**	No. of participants/ sample size	Was there a control group?	Reported effects/outcomes	
Availability (percentage of health workers working in rural areas after graduation)[8]												
1	Health assistants, Marshall Islands	Observational study	No adjustments reported	None	None	Small sample size	None	Very low	14 health assistants	No	The study found that 8 new health centres came into operation as a result of the contribution of the 14 graduate health assistants.	Keni 2006
1	técnicos de cirurgia, Mozambique	Observational study	No adjustment reported	None	None	None	None	Very low	59 MOs and 34 TCs	Yes, but inappropriate comparison group[9]	Seven years after graduation, 88% of these graduates were still working in the district hospitals. But the percentage of Medical officers still in district hospitals two years later was only 0, 22 and 0% for the classes of 1987, 1988 and 1996, respectively. *Supporting evidence: In Mozambique, técnicos de cirurgia perform 92% of all major obstetric surgical interventions in rural hospitals. Without them, provision of emergency obstetric care in rural areas would be impossible.*	Pereira 2007
Competence												
3	Lay health workers (LHW), HICs	RCTs	None	None	Volunteers and community health workers. Not rural	None	None	Moderate	1117 patients	Yes	Three studies (Barnes 1999; Johnson 1993; Krieger 2000) provide strong evidence that LHW based promotion strategies can increase the uptake of immunization in both adults and children (RR=1.30[95% CI 1.14, 1.48] p=0.0001). There was little heterogeneity (p=0.95; I2=0%).	Lewin 2005[10]
Responsiveness												
None												
Unintended effects												
None												

[8] Supporting evidence:
Mullan and Frehywot (2007). No information on study design, no comparison groups used. Provides supporting evidence that new/different types of health workers are increasing the availability of health workers in sub-Saharan Africa. *Non-physician clinicians (NPC) were active in 25 of the 47 sub-Saharan African countries investigated. Many NPCs were recruited from rural and poor areas, and usually trained closer to their geographical origin and eventual place of service than did those who received medical education at largely urban institutions. Therefore, their presence has been especially important for deployment of health care to rural and hard-to-serve regions.*

[9] After 2 years, medical graduates are almost always transferred from district hospitals to urban hospitals.

[10] This is a Cochrane systematic review.

B3. Ensure compulsory service requirements in rural and remote areas are accompanied with appropriate support and incentives so as to increase recruitment and subsequent retention of health professionals in these areas												
Quality assessment									**Summary of findings**			**Reference**
No. of studies and study reference	Targeted cadre of health worker	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considerations	**Quality of evidence**	No. of participants/ sample size	Was there a control group?	Reported effects/outcomes	
Availability (measured as the percent of compulsory service physicians retained *after* their compulsory period in a rural area)[11]												
1	Physicians, Japan	Retrospective cohort study	None	None	None	None	Large magnitude of effect	Moderate	1255 graduates from Jichi Medical University (JMU)	No	On average, 69.8% of JMU graduates remained in their home prefectures for at least six years after their nine-year contractual obligation.	Matsumoto 2008
Competence (measured as whether found the compulsory service improved competencies, or was professionally rewarding)												
1	Physicians, South Africa	Observational study, interviews and FGDs	No adjustments reported	None	Weak reporting of outcomes	None	None	Very low	292 compulsory service (CS) doctors	No	Most doctors felt they improved their competencies in the areas of making independent decisions, graining confidence and learning of new skills.	Reid 2001
1	Physicians, Ecuador	Observational study, questionnaires	No adjustments reported		Indirect outcome (percentage who found the compulsory service rewarding)			Very low	127 physicians	No	94% of respondents found that their compulsory service year was rewarding, both personally and professionally.	Cavender 1998
Responsiveness[12]												
None												
Unintended effects: dissatisfaction over clinical supervision and work environment in rural areas												
1	Physicians, South Africa	Observational study, interviews and FGDs	No adjustments reported					Very low	292 CS doctors	No	"However, a significant minority (23%) felt that the clinical supervision they had received was poor or non-existent. When analysed in terms of location, it was found that those in hospitals with a rural allowance were significantly more negative regarding clinical supervision compared with those in institutions that did not qualify for a rural allowance."	Reid 2001

[11] Supporting evidence:
Frehywot (*forthcoming*). Lack of available analysis and data on compulsory service schemes. *A comprehensive literature review found that some form of compulsory service is/has been in existence in 70 countries across the world, many of which direct health workers into rural and remote areas.*

[12] Supporting evidence:
Reid (2001). Surrogate outcome (perceived effect of compulsory service scheme on health systems). The effect of the whole system on the health system was seen in better staffing levels in many rural hospitals, more frequent visits to outlying clinics and shorter outpatient queues in some instances.
Frehywot (*forthcoming*). Lack of available analysis and data on compulsory service schemes. A comprehensive literature review found that some form of compulsory service is/has been in existence in 70 countries across the world.

B4 Provide scholarships, bursaries or other education subsidies with enforceable agreements of return of service in rural or remote areas to increase recruitment of health workers in these areas												
Quality assessment									**Summary of findings**			**Reference**
No. of studies and study reference	Targeted cadre of health worker	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considerations	**Quality of evidence**	No. of participants/ sample size	Was there a control group?	Reported effects/outcomes	
Availability (measured as retention and physician density)												
20	Most studies targeted physicians, HICs	Observational studies	None	Studies varied in definition of retention, enrolment period, the time to follow-up	None	None	None	Low	Not known	No	18 studies assessed the retention in *any* underserved area: 12-90% of the physicians were retained in an underserved area post-obligation. Seven studies assessed retention in the *same* (underserved) area: six found that participants were less likely than non-participants to remain in the same area and one study did not find a significant difference. 13 studies assessed provision of care or retention in *any* underserved area. 11 found that participants were more likely to (continue to) practice in any underserved area and two found the opposite. Inconsistent results among six studies assessing numbers and densities.	Bärnighausen 2009[13]
Competence												
None												
Responsiveness (measured as satisfaction of participants with their work and personal lives in underserved areas)												
7	Most studies targeted physicians, HICs	Survey	None	Serious inconsistency	Weak reporting of outcome	None	None	Very low		No	Variable results with a spectrum reflecting low to high levels of satisfaction.	Bärnighausen 2009
Unintended effects												
None												

[13] This is a systematic review. Therefore, we only searched for relevant articles published after this systematic review. Interventions included 5 different types of programmes (service-requiring scholarships, educational loans with service requirements, service-option educational loans, loan repayment programmes, and direct financial incentives). Financial incentives to serve for one year in an underserved area ranged from USD 1358 to USD 28 470, in constant (2000) United States dollars.

Financial incentives evidence profile

C1. Use a combination of fiscally sustainable financial incentives such as hardship allowances, grants for housing, free transportation, paid vacations etc., sufficient enough to outweigh the opportunity costs associated with working in rural areas, as perceived by health workers, to improve rural retention												
Quality assessment									**Summary of findings**			**Reference**
No. of studies and study reference	Targeted cadre of health worker	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considerations	**Quality of evidence**	No. of participants/ sample size	Was there a control group?	Reported effects/outcomes	
Availability (measured as retention; measured as proportion of health workers recruited to rural area; measured as retention rates)[14]												
1	Physicians, pharmacists and dentists Niger	Before- and-after study, use of census data	No adjustments reported	None	Serious: did not compare incentive plan with no incentive plan	None	None	Low[15]	197	No	The number of physicians practising outside of Niamey (capital) went from 93 in 2005 to 134 in 2008, an increase of 44%. The same trend was seen with pharmacists and dentists – a respective rise of 46% and 42% of those practising outside of Niamey	Ministère de la Santé publique, Niger 2008
1	Physicians, Australia	Observational study	No adjustments reported	None	Serious: did not compare incentive plan with no incentive plan	None	None	Very low	1091	No	One incentive plan (CPS) has consistently achieved higher retention rates, from 86% one year after initial payment to 65% after five years. Retention rates for another plan (FPS) declined from 66% one year after initial payment to 31% after five years[16]	Gibbon 2006
Competence												
Responsiveness												

[14] Supporting evidence:
Koot (2005). No comparison group used, financial incentives used with support for postgraduate training opportunities. Supporting evidence that the number of doctors recruited to rural areas increased. *In total 68 doctors have been contracted under the retention scheme, between September 2003 and December 2004.* Additional supporting evidence for surrogate outcomes (intention to go to rural area). *The majority of the doctors interviewed indicated that without the incentives they would not have come to the district where they were working. They would have tried to find more attractive postings (A or B districts), or would have left the government service.*
Reid (2004). No comparison group and largely descriptive study. Supporting evidence for surrogate outcome that financial incentives can have a positive impact on intentions to stay in a rural area. *After implementation of the new allowance, the data suggest that between 28% and 35% of rural health professionals, largely professional nurses, have actually changed their short-term career plans because of the new rural allowance.*
Ministère de la Santé publique, Niger (2008). Surrogate outcome, attractiveness/motivation. *The comparison between the levels of motivation of doctors, pharmacists and dentists based on surveys of 2005 and 2008 actually shows that the situation improved in 2008 compared with 2005. The proportion of doctors, pharmacists and dentists moderately or highly motivated increased from 79% in 2005 to 88% in 2008, resulting in a gain of 9% between the two surveys.*
Codjia (2009): No comparison group used for this outcome measured and lacking distinct link to retention. Supporting evidence that financial incentives are key to satisfaction of those working in a rural area. *Doctors reported that the would be most satisfied with a bundled approach of strategies that combines support in finding a post and contracting, provides an "installation package" and a means of transport and accommodation, provides a regular salary comparable to that of a public post, the opportunity for professional development and an opportunity to receive 25% of the medical payments.*

[15] Upgraded from very low to low due to sound methodology and concise use of census data.

[16] CPS = Central Payments System. This component of the RRP seeks to recognize general practitioners based on Medicare data relating to their services in rural and remote locations over a number of years.
FPS = Flexible Payments System. The FPS recognizes long-serving general practitioners who do not receive a fair and equitable level of support under the CPS because their services are not captured by Medicare data or because their locations are not adequately taken into account under the CPS.

Financial incentives evidence profile

C1. Use a combination of fiscally sustainable financial incentives such as hardship allowances, grants for housing, free transportation, paid vacations etc., sufficient enough to outweigh the opportunity costs associated with working in rural areas, as perceived by health workers, to improve rural retention												
Quality assessment									**Summary of findings**			**Reference**
No. of studies and study reference	Targeted cadre of health worker	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considerations	**Quality of evidence**	No. of participants/ sample size	Was there a control group?	Reported effects/outcomes	
Unintended effects Dissatisfaction over classification of who is entitled to the financial incentive												
1	Physicians, New Zealand	Observational study	No adjustment	None	Serious: did not compare incentive plan with no incentive plan	None	None	Very low	469 physicians	No	The use of 35 points or more on the Rural Ranking Scale (RRS) as the definition of a “rural GP” has not pleased everyone. The RGPN argued strongly for a 30 point cut-off. Some GPs feel strongly that they are still rural GPs and the RRS does not fairly categorize them. Some rural GPs in areas with high percentages of community services cardholders have found themselves financially disadvantaged by the new payment system. As there is no pro-rating of the rural bonus payment, part-time GPs may earn virtually the same rural bonus payment as full-time GPs in the same locality. These inequities need to be corrected.	Janes 2004

Support strategies evidence profiles

D1: Improve living conditions for health workers and their families and invest in infrastructure and services (sanitation, electricity, telecommunications, schools etc.) as these factors have a significant influence on a health worker's decision to locate to and remain in rural areas												
Quality assessment									**Summary of findings**			**Reference**
No. of studies and study reference	Targeted cadre of health worker	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considerations	**Quality of evidence**	No. of participants/ sample size	Was there a control group?	Reported effects/outcomes	
Availability[17]												
None												
Competence												
None												
Responsiveness												
None												
Unintended effects												
None												

[17] No direct evidence available. Supporting evidence:
Kotzee (2006). Very small sample size, no comparison group. Supporting evidence for surrogate outcome that improved living conditions can improve attractiveness and intentions to go to/stay in rural service. *The impact of poor accommodation on retaining doctors was clearly stated, and it was mentioned that many doctors leave as soon as they finish their year of compulsory community service because their houses are falling apart. However, some doctors who had good accommodation mentioned that this was one of the more important reasons for them to stay on at a particular hospital.*
Lehmann (2008). Comprehensive literature review, but no primary/evaluation data gathered. Supporting evidence for surrogate outcome that living conditions and the local environment are key to why staff chose to join or leave health service in remote areas. *While the literature is inconclusive on the role that individual characteristics play in choice of remote practice, it is quite unanimous that the general living environment, together with social obligations, are important elements in decisions on where to work. Lack of housing, lack of health care and lack of schools for children are quoted internationally as reasons why staff either do not join or leave health services in remote areas.*

D2: Provide a good and safe working environment, including appropriate equipment and supplies, supportive supervision and mentoring, in order to make these posts professionally attractive, and thereby increase the recruitment and retention of health workers in remote and rural areas												
Quality assessment									**Summary of findings**			**Reference**
No. of studies and study reference	Targeted cadre of health worker	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considerations	**Quality of evidence**	No. of participants/ sample size	Was there a control group?	Reported effects/outcomes	
Availability[18]												
None												
Competence												
None												
Responsiveness												
None												
Unintended effects												
None												

[18] No direct evidence available. Supporting evidence:
Kotzee (2006). Very small sample size, no comparison group. Supporting evidence for surrogate outcome that improved working environment can improve attractiveness and intentions to go to/stay in rural service. *Doctors felt that their current working conditions were poor and this contributed to the "stress" of working in rural hospitals. A number of doctors stated that the working conditions were one of the most important factors contributing to good job satisfaction.*
Henderson (2008). No information on study design (literature review). Supporting evidence for surrogate outcome that improved working environment has a strong influence on job satisfaction and retention. *Decisions by nurses and doctors to migrate are often related to a poor working environment. All workers require adequate facilities and conditions to do their jobs properly. While most evidence is anecdotal, the benefits of improving working and living conditions appear to be significant.*

D3: Identify and implement appropriate outreach activities to facilitate cooperation between health workers from better served areas and those in underserved areas, and, where feasible, use telehealth to provide additional support to health workers in remote and rural areas.												
Quality assessment									**Summary of findings**			**Reference**
No. of studies and study reference	Targeted cadre of health worker	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considerations	**Quality of evidence**	No. of participants/ sample size	Was there a control group?	Reported effects/outcomes	
Availability (measured as perceived/reported impact on attractiveness of rural post)												
3	Physicians Canada	Observational studies	None	None	Surrogate outcome (perceived impact on attractiveness of rural post)	Yes	None	Very low	109 physicians and managers	No	Interviews highlighted that telehealth could have a significant impact on the recruitment and retention of physicians in rural/remote areas. According to physicians and managers, telehealth benefits include better access to specialized services in remote regions, improved continuity of care, and increased availability of information. It also improves physicians' practice by facilitating continuing medical education, contacts with peers, and access to a second opinion. At the hospital and health region levels, telehealth has the potential to support the development of regional reference centres, favour retention of local expertise, and save costs. Conditions for successful implementation of telehealth networks include the participation of clinicians in decision-making, the availability of dedicated human and material resources, and a planned diffusion strategy.	Gagnon, 2006 and 2007 Watanabe 1999
Competence												
Responsiveness (measured as reduction in referral rates, improvement in care received and number of specialist consultations)												
1	Physicians Spain	Controlled interventional study	None	None	Indirect outcomes (study not about retention)	None	None	Low	13 doctors	Yes	Reduction in consultation visits to specialists for patients – total reduction, measured by difference between the relative risk reduction in the control and the subject group, was 19.36% in all medical specialties. There was also a noted reduction in hospital admissions and prescription of drugs (reduction more in subject group than control group).	Como del Corral 2005
2	Physicians and surgeons USA and Australia	Controlled before-and-after study, interrupted time series	Potential biases in studies	None	None	None	None	Low	Howe: 315 patients Gruen: 5184 patient consultations	Yes	One study found that outreach improved the proportion of patients receiving guideline-consistent breast cancer care. Outreach led to 9% more breast cancer patients receiving an oncology consult. Another showed that outreach in four surgical specialties increased numbers of consultations overall and reduced hospital outpatient visits (390% increase in number of specialist consultations involving remote community patients).	Gruen 2009[19]
Unintended effects												
None												

[19] This is a Cochrane systematic review.

D4: Develop and support career development programmes and provide senior posts in rural areas so that health workers can move up the career path as a result of experience, education and training, without necessarily leaving rural areas												
Quality assessment									**Summary of findings**			**Reference**
No. of studies and study reference	Targeted cadre of health worker	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considerations	**Quality of evidence**	No. of participants/ sample size	Was there a control group?	Reported effects/outcomes	
Availability[20] (measured as factors that would make a health worker choose a certain job post)												
1	Health workers (mix) Swaziland	Observational study, surveys, FGDs, interviews (random sampling)	None	None	Not focused on rural health workers	None	None	Very low	160 health workers	No	Changes to workers' terms and conditions of employment were suggested by health workers to make them more likely to stay. A clear policy on the terms and conditions of service for the health-care professionals needs to be formulated, which should spell out clearly all the career paths and prospects for professional growth for the various health-care professions. *Supporting evidence:* General "support" for health workers was deemed the most important factor in relation to retention – if it is lacking, staff said they would want to leave, if it is perceived as satisfactory, it positively motivates staff to remain.	Masango 2008
1	Nurses Malawi	DCE	None	None	Surrogate outcome (preferences for type of job attributes) Not rural- focused	None	None	Very low	107 nurses	No	Through the various DCE scenarios presented, shortening the time period before having the opportunity to upgrade was ranked most highly in terms of job attractiveness factors.	Mangham 2008
Competence												
None												
Responsiveness												
None												
Unintended effects												
None												

[20] Supporting evidence:
Lehmann (2008). Comprehensive literature review, but no primary /evaluation data gathered. Supporting evidence that the link between access to continuing education and professional advancement and retention is unclear. *Much of the literature focusing on high-income countries did not find close correlations between opportunities of career advancement and turnover. However, evidence from a 6-country study in Africa (Cameroon, Ghana, Senegal, South Africa, Uganda and Zimbabwe) based on interviews with between 5 and 20% of the total number of skilled health personnel in the public sector in each country, showed a much stronger correlation (with retention).*

Support strategies evidence profiles

D5: Support the development of professional networks, rural health professional associations, rural health journals etc. in order to improve the morale and status of rural providers and reduce feelings of professional isolation												
Quality assessment									**Summary of findings**			**Reference**
No. of studies and study reference	Targeted cadre of health worker	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considerations	**Quality of evidence**	No. of participants/ sample size	Was there a control group?	Reported effects/outcomes	
Availability (measured as number of years in rural post; reduction in number of GPs wanting to leave rural post)												
1	Physicians Mali	Cross sectional study	None	None	None	None	None	Moderate	120 doctors	Yes	Those supported by the AMC/Santé Sud and the Malian government stayed on average for 4 years in rural areas, in contrast to those who are not supported in the negotiations with their employers and who did not receive an installation package.	Codjia 2009
1	Physicians Australia	Before and after cohort study	None	None	Serious (outcome is related to attractiveness)	None	None	Very low	221 rural doctors	No, before and after design	Reduction in the number of GPs wanting to leave rural practice in the short to medium term (30% to 25%). Many indicated this was due to the improved networking and increased contact with other GPs following the Dr Doc programme.	Gardiner 2006
Competence												
None												
Responsiveness												
None												
Unintended effects												
None												

D6: Adopt public recognition measures such as rural health days, awards and titles at local, national and international levels to lift the profile of working in rural areas as these create the conditions to improve intrinsic motivation and thereby contribute to the retention of rural health workers												
Quality assessment									**Summary of findings**			**Reference**
No. of studies and study reference	Targeted cadre of health worker	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considerations	**Quality of evidence**	No. of participants/ sample size	Was there a control group?	Reported effects/outcomes	
Availability (measured as reported importance of recognition for health workforce motivation and retention)[21]												
14	Health professionals LICs	Qualitative and mixed methods studies	None	None	Indirect outcome (reported importance of recognition for health workforce motivation and retention)	None	None	Very low	Not available	No	Recognition and/or appreciation, either from managers, colleagues, or the community was a theme found in 70% studies. In some articles, recognition by the employer and community was cited as being one of the most important motivating factors for health workers.	Willis-Shattuck 2008[22]
Competence												
None												
Responsiveness												
None												
Unintended effects												
None												

[21] Supporting evidence:
http://www.rudasa.org.za/award.php South Africa rural doctor of the year website.
http://www.countrydoctoraward.com/ USA country doctor of the year website.
http://www.rdaa.com.au/default.cfm Australia rural doctor of the year.

[22] This was a systematic review on improving motivation and retention of health professionals in developing countries.

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