World Health Organization

RETENTION OF THE HEALTH WORKFORCE IN RURAL AND REMOTE AREAS: A SYSTEMATIC REVIEW

Web Annex A. GRADE evidence profiles

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EDUCATION EVIDENCE PROFILES

Quality assessment									Summary of findings			Reference
No. of studies	**Health worker occupation(s)**	**Design**	**Limitations**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Quality of evidence**	**No. of participants/sample size**	**Was there a control group?**	**Reported effects/outcomes**	
A1. Use targeted admission policies to enrol students with a rural background in education programmes for various health disciplines, in order to increase the likelihood of graduates choosing to practise in rural areas. Bundled with A2, A3 and A4 (location, curriculum and rural community engagement/exposure)												
Availability (measured as percentage of health workers with a rural background currently practising in rural area)												
1	Doctors, Thailand	Cohort study	Rural background students (CPIRD) were allocated their region of origin while the control group had no choice of where to work.	None identified	Workplace allocation system of control group and rural background group were not equal.	Not suspected	Magnitude of effect	Moderate	10 018 students	Yes	Overall 57.6% retention rate. CPIRD retained 72.1% versus normal track 53.8% p < 0.001. Graduate entry associated with higher retention. CPIRD doctors worked rurally 62.3% compared with 49% normal track p < 0.001. Resignation after initial 3-year commitment very common. The specific geographical location had an impact, with the Northeast and South having greater retention. Greater contact hours of CBL during the degree was associated with greater retention OR 1.175 (1.030-1.341) p 0.015.	Boonluksiri P, Tumviriyakul H, Arora R, Techakehakij W, Chamnan P, Umthong N. Community-based learning enhances doctor retention. Educ Health (Abingdon). 2018;31(2):114-8.
1	Medical graduates, Australia	Cross-sectional cohort study	Prior intention to practise in rural areas not known.	None identified	None identified	None identified	Magnitude of effect	Moderate	729 medical graduates of the University of Queensland 2002-2011	Yes	Rural background (RB) and attendance of a rural clinical school (RCS) are independent, duration-dependent and additive predictors of long-term rural practice (LTRP). Independent pedictors of LTRP (odds ratio [95% confidence interval] were RB 2.10 [1.37-3.20]), RCS-1 (2.85 [1.77-4.58]), RCS-2 (5.38 [3.15-9.20]), general practice (GP) (3.4 [2.13-5.43]) and bonded scholarship (2.11 [1.19-3.76]). Compared with being single, having a metropolitan background (MB) partner was a negative predictor (0.34 [0.21-3.76]); the effects of RB and RCS were additive compared with MB and metro school (reference group) RB and RCS-1 (6.58 [3.32-13.04]), RB and RCS-2 (10.36 [4.89-21.93]).	Kwan MMS, Kondalsamy-Chennakesavan S, Ranmuthugala G, Toombs MR, Nicholson GC. The rural pipeline to longer-term rural practice: general practitioners and specialists. PLoS ONE. 2017;12(7):e0180394.
1	Doctors, United States of America	Serial, quantitative analysis of university and medical board location of practice	Time span may have been short. Practice location prior to 1997 was not assessed in this study.	None identified	None identified	None identified	None identified	Moderate	2823 over 11 years	Yes	Recruitment of students combined with a rural-focused curriculum yielded positive outcomes related to primary care practice and decisions regarding practice location. RMED graduates were considerably more likely than non-RMED graduates to choose family medicine, a primary care specialty and be currently practising in a rural location. RMED graduates were 14.4 times more likely than non-RMED graduates to choose family medicine, 6.7 times more likely to choose a primary care practice specialty, 17.2 times more likely to be currently practising in a rural location and 12.8 times more likely to be practising in a primary care shortage zip code.	MacDowell M, Glasser M, Hunsaker M. A decade of rural physician workforce outcomes for the Rockford Rural Medical Education (RMED) Program, University of Illinois. Acad Med. 2013;88(12):1941-1947.
1	Nursing students, Norway	Quantitative cross-sectional survey	Small sample size, not generalizable	None identified	None identified	Unclear	None identified	Low	233 (73.9% rural)		Recruited according to rural background and community connections into a flexible study programme. Post-programme, 87.5% of registered nurses (RNs) were employed in community health services, with an 81.6% retention rate; after 20 years 85% were still there (reduced turnover). 89% undertook further studies; 2% also completed further postgraduate education after the DNE programme.	Norbye B, Skaalvik MW. Decentralized nursing education in northern Norway: towards a sustainable recruitment and retention model in rural Arctic healthcare services. Int J Circumpolar Health. 2013;72:22793.
1	Doctors, Philippines	Retrospective case study	None identified	None identified	None identified	None identified	None identified	Moderate	164 graduates	No	80% (160) of graduates practising in local underserved rural/remote areas. Very positive impact of a rurally based medical school.	Cristobal F, Worley P. Can medical education in poor rural areas be cost-effective and sustainable: the case of the Ateneo de Zamboanga University School of Medicine. Rural Remote Health. 2012;12:1835.
Competence (measured as a comparison of exam results between rural curriculum students and mainstream students)												
1	Medical students, Canada	Quantitative, cross-sectional study	None identified	None identified	None identified	None identified	None identified	Moderate	12 000 applicants, 346 admissions to medical course, 220 Northern Ontario School of Medicine (NOSM) graduates 2009-2012	Yes	91% from Northern Ontario, 9% from other rural/remote areas of Canada. 45% NOSM students from rural or remote communities unlike the rest of Canada with 10% rural students. GPA comparable with other Canadian medical schools. 61% choose family medicine programmes, mainly rural; 33% general specialties; 6% sub-specialties. Rest of Canada 30%, 40% and 30% respectively. Medical Council of Canada Part 1 Examination - NOSM students performed above national average. In Part 2 Examination in 2008 and 2010, NOSM trainees' scores placed NOSM 1st of the 17 Canadian medical schools.	Agréus L, Strasser R. [Medical education in rural areas - a radical concept from Canada]. Lakartidningen. 2014;111(3-4):91-92.
Responsiveness (measured as impact on health outcomes)												
1	Doctors, Philippines	Retrospective case study	None identified	None identified	None identified	None identified	None identified	Moderate	164 graduates	No	80% (160) of graduates practising in local underserved rural/remote areas. Very positive impact of a rurally based medical school. Reduced infant mortality to 90%. Increased health knowledge, increased referrals (improved system). Increased volunteer community health workers.	Cristobal F, Worley P. Can medical education in poor rural areas be cost-effective and sustainable: the case of the Ateneo de Zamboanga University School of Medicine. Rural Remote Health. 2012;12:1835.

A2. Locate health education 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 a rural area												
Quality assessment									**Summary of findings**			**Reference**
No. of studies	**Health worker occupation(s)**	**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 of health workers graduated from rural school currently practising in rural area; percentage of graduates from family medicine residency programmes in rural area now practising in a rural area)												
1	Doctors, Australia	Longitudinal mixed methods, sequential exploratory design	Small sample size. Response rate of 64%.	None identified	None identified	No quantification of effects reported	None identified	Low	97	No	40% of respondents were non-urban and general practice was most frequent specialty choice. Primary drivers were personal/family reasons and specialty training requirements. The longer the exposure to training in the rural context the greater the impact on interest in future rural practice.	Eley DS, Synnott R, Baker PG, Chater AB. A decade of Australian Rural Clinical School graduates - where are they and why? Rural Remote Health. 2012;12:1937.
1	General practice trainees, Australia	Observational, audit (quantitative)	None identified	None identified	None identified	None identified	None identified	Low	222	No	53% of trainees remained in rural areas, but over 40% moved to practise in metropolitan areas. Local contextualization of training, completing additional advanced skills training and being an Australian graduate were associated with increased retention in the rural areas.	Kitchener S. Local regional workforce returns on investment of a locally governed and delivered general practice vocational training program. Aust Health Rev. 2019.
1	Doctors, Canada	Mixed mathods, quantitative cross-sectional survey supplemented with qualitative in-depth interviews	Small sample size. Lacks longitudinality.	None identified	None identified	None identified	None identified	Low	19	No	21 (65.6%) of 32 graduates from the Distributed Medical Education programme established practice in a rural region. Five key themes impacting on decision to remain practising in a rural area: family ties to the region, practice opportunities, positive clerkship (undergraduate) and residency (postgraduate) experiences, established professional relationships, and lifestyle opportunities.	Lee J, Walus A, Billing R, Hillier LM. The role of distributed education in recruitment and retention of family physicians. Postgrad Med J. 2016;92(1090):436-440.

1	Doctors and dental residents, United States of America	Mixed methods: lessons learned identified in programme management and evaluation of programme	No serious limitations. Expanding programme.	None identified	Cost and maintenance support; continuity of care of patients as residents change; staying accredited due to RHWF shortage/lack of supervisors.	None identified	Magnitude of effect	Moderate	741 residents (junior doctors), 59 programmes: 37 family medicine, 8 internal medicine, 3 obstetrics and gynaecology, 3 paediatrics, 1 geriatric, 3 dental, 4 psychiatry	Yes	20% of the studied programmes were rurally based compared with 6% in comparison group. Maintaining community-based residency programmes once established requires ongoing financing, the maintenance of delicate partnerships, vigilance in meeting the evolving requirements of accreditation, and the ability to adapt to a health care environment that is constantly changing under policy and payment reforms. When successful, they substantially benefit communities, in particular, those historically facing health disparities and health workforce shortages. In 2014-2015 28/59 still had rural based training and improved quality of care.	Lee M, Newton H, Smith T, Crawford M, Kepley H, Regenstein M et al. The benefits of physician training programs for rural communities: lessons learned from the Teaching Health Center Graduate Medical Education Program. J Health Care Poor Underserved. 2016;27(4a):83-90.
1	Postgraduate trained doctors in Iowa, United States of America	Longitudinal quantitative; 1 year after graduation and every 2 years thereafter, plus survey	Long period of study: 1977-2014 over which dramatic changes occurred in scale and scope of practice; single residency programme. No confounders identified for selection into programme.	None identified	Variation of curriculum focused on rural practice.	May not be generalizable to other practice network systems or states.	Community stability over time	Moderate	1645 (8 residency programmes)	Non-community based comparison group	Increased retention of family medicine graduates 5 years post rural training (Iowa Family Medicine Training Network, IFMTN). International graduates and women were less likely to practise rurally. There were some variations from decade to decade amongst cohort choices. Location of FM training was not a strong predictor of rural practice. Location of undergraduate medical education was a strong predictor for practice within state.	Nelson GC, Gruca TS. Determinants of the 5-year retention and rural location of family physicians: results from the Iowa Family Medicine Training Network. Fam Med. 2017;49(6):473-476.
1	Doctors, Thailand	Cohort study	Limited by administrative database not built as a research tool; lack of reported individual characteristics of doctors.	None identified	None identified	None identified	None identified	Moderate	7157: 1093 graduates from CPIRD track, 6064 that graduated through normal channels	No	The predicted median survival time in rural hospitals was 4.2 years for the CPIRD and 3.4 years for the normal track. The normal track doctors had significantly higher risk of leaving public service - about 1.5 times more than the CPIRD doctors.	Pagaiya N, Kongkam L, Sriratana S. Rural retention of doctors graduating from the rural medical education project to increase rural doctors in Thailand: a cohort study. Hum Resour Health. 2015;13:10.
1	Medical graduates, Australia	Medical graduate data analysed	Majority of graduates were at early career stage. No measure of rural connection or interest to specific regions was available.	None identified	None identified	None identified	None identified	Moderate	2451 graduates	No	Medical graduates practising rurally in their early career (1–9 years post graduation) are likely to have previous connections to the region, through either their basic medical training, their secondary schooling, or both. 15% of the graduates returned to work in rural areas. 24% of them had trained in the same area.	McGrail MR, O'Sullivan BG, Russell DJ. Rural training pathways: the return rate of doctors to work in the same region as their basic medical training. Hum Resour Health. 2018;16:56.
1	Medical students, Australia	Tracking study of 7 cohorts (cross-sectional)	Time constraints	None identified	None identified	None identified	None identified	Low	536	No	Primary practice location at time of study: 65% undertook internship in non-metropolitan location; metropolitan-origin students more likey to work in major cities.	Sen Gupta T, Woolley T, Murray R, Hays R, McCloskey T. Positive impacts on rural and regional workforce from the first seven cohorts of James Cook University medical graduates. Rural Remote Health. 2014;14:2657.
1	Doctors, Australia	Retrospective cross-sectional study; survey of programme participants	No management of confounders	None identified	None identified	None identified	None identified	Very low	21	No	81% of Remote Vocational Training Scheme programme participants practised in Rural and Remote Medical Area Classification (RRMA) 3 or higher settings from 2-8 years after partcipation.	Wearne S, Giddings P, McLaren J, Gargan C. Where are they now? The career paths of the Remote Vocational Training Scheme registrars. Aust Fam Physician. 2010;39(1-2):53-56.
1	Doctors - medical students, United States of America	Non-randomized intervention, comparing the Rural Medical Scholars (RMS) programme with regional campuses and usual medical education, pre/post intervention quantitative study	No management of confounders	None identified	None identified	None identified	None identified	Moderate	RMS n=54, regional n=182, main campus n=649	Yes, RMS was compared with regional and main campuses	There was a dose-response effect for rural exposure in undergraduate medical education, with OR = 6 of producing a rural doctor for RMS, 2.5 for regional campus, and 1 for main campus.	Wheat JR, Leeper JD, Murphy S, Brandon JE, Jackson JR. Educating physicians for rural America: validating successes and identifying remaining challenges with the rural medical scholars program. J Rural Health. 2018;34:S65-S74.
12	Medical students attending Rural Clinical Schools (RCS), Australia	Cross-sectional, quantitative data analysis	No serious limitation	None identified	None identified	None identified	None identified	Moderate	1695 students from 12 RCS	Yes	RCS have a significant effect that show positive outcomes for the regional medical workforce at 5 years postgraduation. 1.5 times more likely to remain rural if they attend RCS, for extended placement in RCS (> 1 year) 2.6 times more likely.	McGirr J, Barnard A, Cheek C, Garne D, Greenhill J, Kondalsamy-Chennakesavan S et al. The Australian Rural Clinical School (RCS) program supports rural medical workforce: evidence from a crosssectional study of 12 RCSs. Rural Remote Health. 2019;19:4971.
1	Medical graduates of University of New South Wales who spent 1-3 years at RCS between 2003-2010, Australia	Observational study: online survey	None identified	None identified	None identified	None identified	None identified	Very low	214 (66% response rate n= 315)	No	Graduates with 3 years of previous RCS training were more likely to indicate rural areas as their *preferred current* work location, than their colleagues who spent 1 year at an RCS campus (OR = 3.0, 95% CI = 1.2-7.4, P = 0.015). Also RCS graduates who spent 3 years at an RCS were more likely to *intend* to take up rural medical practice after completion of training compared with graduates with 1 year of rural placement (OR = 5.1, 95% CI = 1.8-14.2, P = 0.002). Non-rural medicine entry graduates who spent 3 years at rural campuses were more likely to take up rural practice compared with those who spent just 1 year at a rural campus (OR = 8.4, 95% CI = 2.1-33.5, P = 0.002).	Forster I, Assareh H, Watts LD, McLachlan CS. Additional years of Australian Rural Clinical School undergraduate training is associated with rural practice. BMC Med Educ. 2013;13:37.
Competence (ability to perform job)												

1	Nurses, United States of America	Observational prospective longitudinal qualitative study	None identified	None identified	None identified	None identified	None identified	Moderate	468 total (two groups)	Yes, use of metropolitan nursing residency programme	Rural-based nursing residency programme is associated with increased job satisfaction and decreased job stress in rural nurses.	Bratt MM, Baernholdt M, Pruszynski J. Are rural and urban newly licensed nurses different? A longitudinal study of a nurse residency programme. J Nurs Manage. 2014;22(6):779-791.

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	**Health worker occupation(s)**	**Design**	**Limitations**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Quality of evidence**	**No. of participants/sample size**	**Was there a control group?**	**Reported effects/outcomes**	
1	Young doctors (interns), Norway	Quantitative cohort study	The data might include some incorrect information regarding registration of the doctors' workplaces in April 2014. Methodological challenges in measuring the rural background effect. Confounding not adequately controlled for.	None identified	None identified	The data from the health authorities, which give information on the interns, do not include indications of their geographical affiliations with the study area. The use of a network to map geographical affiliations brings in the possibility of error in the registrations.	The greatest benefit of the medical internship was for the most densely populated municiplalities in the study area.	Very low	388 candidates, of whom 59 signed up early in the study area, 148 were regular interns in the study area and 181 were interns in the comparison area.	Yes	The proportion of interns who signed up early that still worked as doctors in the study area by April 2014 (29%) was twice as high as among the regular interns in the comparison area (14%). Among the 59 interns who signed up early still working in the study area in April 2014, 33% had grown up in the area. The early sign-up model had a net contribution of additional doctors to the study area, even though the number of additional doctors recruited through this special arrangement was limited. Tended to be more effective for the four more densely populated municipalities and not the 15 smaller ones. Practice size of three GPs and professional development important to the decision to go into rural practice.	Gaski M, Abelsen B. Designing medical internships to improve recruitment and retention of doctors in rural areas. Int J Circumpolar Health. 2017;76.
1	Dentists, Australia	Pre-post design, quantitative, longitudinal study for 5 classes up to 8 years postgraduation	Self-selected participants in the programme. Bias from self-selection mitigated by previous study control. Prior rural experience needs to be assessed separately from rural background. Missing data not well explained.	None identified	None identified	None identified	None identified	Low	215 pre- and 231 post-design graduates	No	Rural clinical pacement programme participation was significantly associated with an increased likelihood of working rurally (PR = 2.16).	Johnson G, Byun R, Foster K, Wright F, Blinkhorn A. A longitudinal workforce analysis of a rural clinical placement program for final year dental students. Aust Dent J. 2019;64(2):181-92.
1	Medical students, Australia	Retrospective quantitative cross-sectional survey	None identified	None identified	None identified	None identified	None identified	Moderate	83 from rural group, 140 from urban group. Response rates were 52% and 36% respectively.	Yes	Increase in intent to practise in a rural setting following undergraduate medical education that includes rural clinical placements. In particular, evidence of intent for urban background students suggests that internship and vocational training need to provide sufficient rural clinical experiences to ensure continued interest in rural practice. Extra-curricular activities (rural student club, mentor, rural conference attendance), had positive influence on the intentions of practice location.	Strasser R, Hogenbirk JC, Lewenberg M, Story M, Kevat A. Starting rural, staying rural: how can we strengthen the pathway from rural upbringing to rural practice? Aust J Rural Health. 2010;18(6):242-248.
1	Allied health students, Australia	Longitudinal, qualitative data from semi-structured interviews	Size of cohort	None identified	None identified	Yes. No specific recommendations due to size	Lack of measures of skill in working with Aboriginal people	Very low	7 participants	No	Influence of undergraduate training continues: 5 living in regional or rural towns (1 had just left for a higher position). Attraction: rural job security, professional support and opportunity for professional development.	Thackrah RD, Thompson SC. Learning from follow-up of student placements in a remote community: a small qualitative study highlights personal and workforce benefits and opportunities. BMC Med Educ. 2019;19(1):331.
1	Occupational therapists, physiotherapists, speech-language pathologists, audiologists, Canada	Retrospective cross-sectional study of 2002-2010 programme participants; self-administered questionnaire in June 2011	None identified	None identified	None identified	None identified	None identified	Moderate	280	No	33.9% chose rural or remote practice following graduation. Individuals from rural remote communities were 3.3 times more likely to work in rural/remote areas. Those completing academic studies in addition to clinical components were 3.3 times more likely to move to a rural/remote area after graduation than those not completing the academic semester. Completing more rural clinical placements was associated with greater likelihood of rural practice, independent of rural upbringing. "Job satisfaction, professional networking opportunities and rural lifestyle options were identified as important factors for retention in rural/remote practice areas."	Winn CS, Chisholm BA, Hummelbrunner JA, Tryssenaar J, Kandler LS. Impact of the Northern Studies Stream and Rehabilitation Studies programs on recruitment and retention to rural and remote practice: 2002-2010. Rural Remote Health. 2015;15(2):3126.
1	Doctors, Australia	Cross-sectional study, survey	None identified	None identified	Serious	None identified	None	Low	102	No	An expectation gap during the rural placement during medical school was associated with lower rural-practice self-efficacy. Lower self-efficacy was associated with lower intention to practise rurally. Ensuring good support during student placements may prevent this negative expectation-experience gap, which may have an impact on intention to practise rurally. Most doctors chose their location of practise after graduation. Doctors were happy where they were, whether it was rural or metro, suggesting low incentive to move away from urban areas to rural ones. Doctors with high confidence in their ability to practise rurally were the ones working rurally.	Bentley M, Dummond N, Isaac V, Hodge H, Walters L. Doctors' rural practice self-efficacy is associated with current and intended small rural locations of practice. Aust J Rural Health. 2019;27(2):146-152. https://doi.org/10.1111/ajr.12486
Competence (measured as perception of administrators of the effect of quality of care and knowedge test scores)												
1	Hospital-based clinical supervisors (nursing and medical), Australia	Qualitative cross-sectional survey to discover the impact of supervisory responsibility	None identified	None identified	None identified	Indirect increased retention	None identified	Low	15	No	Three themes were identified from the data: impacts on supervisors; change in hospital learning culture; and student usefulness. The impact on supervisors was positive and led to improved personal satisfaction.	Connolly M, Sweet L, Campbell D. What is the impact of longitudinal rural medical student clerkships on clinical supervisors and hospitals? Aust J Rural Health. 2014;22(4):179-188.

1	Health science students and recent graduates, Australia	Qualitative structured interviews 2-12 months post-placement intervention	Small number, short 4-week placement; first stage of a longitudinal study; community perspective not sought.	None identified	None identified	None identified	None identified	Low	24, 12 interviewed	Not specified	The placement provided sound preparation for future rural practice, removed uncertainties about what to expect and enhanced confidence about being able to cope. 6 of the 8 employed participants were working in regional/rural areas; 1 was interested in working long term in remote settings. Most were concerned about isolation. Community connections and a cultural mentor were considered pivotal to the success of the placement.	Thackrah RD, Hall M, Fitzgerald K, Thompson SC. Up close and real: living and learning in a remote community builds students' cultural capabilities and understanding of health disparities. Int J Equity Health. 2017;16(1):119.
1	Medical students, Australia	Mix of qualitative, ethnographic methods (formal and informal) and interviews	Short duration of the student placement, small group, vested interest of interviewees (bias). Confounders like rural origin or background not managed.	None identified	None identified	None identified	Student perspectives not elicited	Very low	33 interviewees and 15 informal interactions	No	The programme provided a structured, constructive means for prospective doctors to appreciate the assets rather than the deficits of remote area living. Another positive implication was that the programme equipped future doctors (regardless of their eventual work location) to treat a person from the "bush". It also encouraged students to think and act cross-culturally. An important immediate benefit was that the programme offered human resource support to the host organization at a busy time of year.	Toussaint S, Mak D. 'Even if we get one back here, it's worth it...': evaluation of an Australian Remote Area Health Placement Program. Rural Remote Health. 2010;10:1546.
Responsiveness												
1	Medical, nursing and allied health students, Australia	Mixed methods, cross-sectional evaluation study using two questionnaires (debriefing and audience feedback)	None identified	None identified	None identified	None identified	None identified	Low	79	No	Positive short-term outcomes in preparing students for interprofessional practice in a rural setting undertaking a rural community IP project.	Craig PL, Barnard A, Glasgow N, May E. Evaluating the health "hubs and spokes" interprofessional placements in rural New South Wales, Australia. J Allied Health. 2014;43(3):176-183.
Unintended effects (measured by lack of rurality for placements provided)												
1	GP trainees, Germany	Cross-sectional survey, mixed methods	Very short exposure	None identified	None identified	Difficult to isolate the effect of exposure	None identified	Low	500 (72 non-attendants)	Yes	There was a change in view of rural but there was no significant difference in the intention to work in a rural area before/after the one rural-day exposure; intention identical to non-participants - "one day is not enough".	Flum E, Goetz K, Berger S, Ledig T, Steinhaeuser J. Can a 'rural day' make a difference to GP shortage across rural Germany? Rural Remote Health. 2016;16(1):3628.

A4. Revise undergraduate and postgraduate curricula to include rural health topics so as to enhance the competencies of health workers in rural areas, and thereby increase their job satisfaction and retention

Quality Assessment									**Summary of findings**			**Reference**
No. of studies	**Health worker occupation(s)**	**Design**	**Limitations**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Quality of evidence**	**No. of participants/sample size**	**Was there a control group?**	**Reported effects/outcomes**	
Availabilty												
1	Nurses, United States of America	Longitudinal study, data analysis of programme outcomes	No clear outline of process for gathering data	None Identified	None Identified	None Identified	Magnitude of effect	Low	23 community hospitals, 7 community college programmes over 6 years	No	Leadership Education to Advance Practice (LEAP). Online course (6-year programme) and extra in-person visits. Resultant impact on workforce development: 79% increase in nurses matriculating, and length of training reduced by 2.08 years, and from matricultion to BSN qualification by 1 year. Financial loan forgiveness although available, most said they would have gone rural anyway. Started in rural areas and spread to whole state.	Diaz Swearingen C, Clarke PN, Gatua MW, Sumner CC. Diffusion of a nursing education innovation: nursing workforce development through promotion of RN/BSN education. Nurse Educ. 2013;38(4):152-156.
1	Medical students, doctors, Canada	Retrospective, cohort, quantitative study of rural workforce distribution	No serious limitation	None Identified	None identified	None identified	None identified	Moderate	Large Canada-wide comparative study, large numbers of students	Yes	Rural-generalist focused university more likely to have impact on rural medical workforce and where they practise (close to where they trained). Among 391 doctors practising in Newfoundland and Labrador (NL), 257 (65.7%) were Memorial PG graduates and 247 (63.2%) were Memorial MD graduates. Of the 163 FM graduates, 148 (90.8%) were Memorial FM graduates and 118 (72.4%) were Memorial MD graduates. Of the 68 in rural practice, 51 (75.0%) were Memorial PG graduates and 31 (45.6%) were Memorial MD graduates. Of the 41 FM graduates in rural practice, 39 (95.1%) were Memorial FM graduates and 22 (53.7%) were Memorial MD graduates.	Rourke J, Asghari S, Hurley O, Ravalia M, Jong M, Graham W et al. Does rural generalist focused medical school and family medicine training make a difference? Memorial University of Newfoundland outcomes. Rural Remote Health 2018;18:4426.
Competence (measured as a comparison of exam results between rural curriculum students and mainstream students)												
1	Medical students, United States of America	Longitudinal cohort prospective	Only mean scores were available and no statistical test was reported for shelf exam measure	None identified	None identified	None identified	No graduates in practice as of date of publication	Very low	71 (6 withdrew)	Yes, comparison with regular track students	Curriculum adapted to rural, comparison of exams, all continuing students who have taken Part 1 of USMLE have passed. Clinical shelf exam scores for rural-PRIME students are approximately equivalent to the regular track students.	Eidson-Ton WS, Rainwater J, Hilty D, Henderson S, Hancock C, National CL et al. Training medical students for rural, underserved areas: a rural medical education program in California. J Health Care Poor Underserved. 2016;27(4):1674-1688.
Responsiveness (measured as confidence in rural clinical skills)												
Competence (ability to perform job)												
Unintended effects												

A5. Design continuing education and development programmes that meet the needs of rural health workers, which are accessible from where they live and work, so as to support their retention

Quality assessment									**Summary of findings**			**Reference**
No. of studies	**Health worker occupation(s)**	**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 practising in rural communities)												
1	Doctors, United States of America	Controlled trial	Sample size , study design	None identified	Unclear	None identified	None identified	Very low	4 family practices, 41 clinicians	Yes	Rural Oregan Academic Detailing (ROAD) clinicans prefer face-to-face academic detailing in rural practice settings versus distance eduaction. 90% of participants reported being satisfied or very satisfied with the educational approaches utilized. Those in the distance learning group scored higher in all programme satisfaction content areas compared with those from the in-person group. The in-person group scored higher for all educational content questions as well as when rating the likelihood of participating in future programmes.	Hartung DM, Hamer A, Middleton L, Haxby D, Fagnan LJ. A pilot study evaluating alternative approaches of academic detailing in rural family practice clinics. BMC Fam Pract. 2012;13:129.

1	GP doctors, United Kingdom	Cross-sectional survey	Unclear as to whether the fellowship confirms a prior intention to work in rural practice, or whether it provides a new opportunity through protected exposure.	None identified	None identified	Lacks detail	None identified	Very low	66	No	Approximately 75% of graduates are in important roles in Scotland: 63 (97%) working currently in general practice, 53 of whom were doing so in Scotland. 46 fellows (71%) in the period surveyed were working in rural areas or accessible small towns in Scotland, 39 in substantive general practice roles (60%).	MacVicar R, Clarke G, Hogg DR. Scotland's GP rural fellowship: an initiative that has impacted on rural recruitment and retention. Rural Remote Health. 2016;16(1):3550.
1	Community midwives and facility managers, Afghanistan	Cross-sectional evaluation using mixed methods: surveys by questionnaire and interviews	Difficulty obtaining data. Despite assurance of confidentiality, inexact responses may have been made, rather than those reflecting reality.	None identified	None identified	Only 11 provinces were assessed	Community factors influencing retention were not elicited	Low	456 facilities surveyed, 570 midwives interviewed	Yes	Barriers to service provision were identified with some unique to context, whereas others were similar to those identified as systemic in the World Midwifery report. There is no formal system for tracking retention beyond the 3-month period following graduation. Reasons to leave: 46.4% insecurity (civil unrest/armed conflict); 28.1% family disagreement; 9.9% increased workload without compensation (task shifting); 7.8% lack of housing.	Mansoor GF, Hashemy P, Gohar F, Wood ME, Ayoubi SF, Todd CS. Midwifery retention and coverage and impact on service utilisation in Afghanistan. Midwifery. 2013;29(10):1088-1094.
1	Primary care doctors, Norway	Observational pre- and post-vacancy rate	Limited data, other variables not accounted for	None identified	None identified	None identified	None identified	Low	267 medical graduates, 53 doctors in programme, with 34 (65%) still working in rural 5 years later	No	Number of GPs retained in remote areas rose from 38% to 65% in 5 years. Postgraduate medical training can be conducted in remote areas and ensures professional development is provided remotely, and is conducive to retention. Rural intern position allows for junior doctor and family to grow roots in rural area while training.	Straume K, Shaw DMP. Effective physician retention strategies in Norway's northernmost county. Bull World Health Organ. 2010;88(5):390-394.
Competence (measured as confidence in practising in rural areas)												
1	Paediatric nurses, Canada	Cross-sectional qualitative semi-structured phone interviews after taking the professional development activities	Confounders not adjusted for	None identified	None identified	None identified	None identified	Very low	4000 hours of professonal development accessed	No	4000 hours of professional development (PD). 20% paid PD time off increased knowledge, credentials and confidence. Staff retention, quality of care improvement, collaboration and engagement, hospital profile and personal growth emerged.	Healey-Ogden M, Wejr P, Farrow C. British Columbia: improving retention and recruitment in smaller communities. Nurs Leadersh (Tor Ont). 2012;25 Spec No 2012:37-44.
1	International medical graduates (IMGs), Australia	Cross-sectional, survey with analysis and pre- and post-programme evaluations	Low numbers of participants	None identified	None identified	None identified	None identified	Very low	15 IMGs (13 in hospital, 2 in GP)	No	Participants rated the programme highly and reported increased knowledge, skills and professionalism. The website promoted learning networks, which were considered essential to sustained professional networks.	Wright A, Haige C, Reagan M, Sunderji I, Vijayakumar P, Nestel D. Evaluation of an educational program to support international medical graduates in rural Victoria, Australia. Intern Med J. 2010;40:62-63.
1	Midwives, Liberia	Descriptive study of continous professional development (CPD) model using mobile learning and regular mentoring	Implementation challenges impacting effectiveness	None identified	None identified	None identified	CPD programme now established by regulatory body of midwives in Liberia	Low	24	No	The new CPD programme links maintenance of professional competence through continued training/education and mentoring and highlights potential and future positive impact to improve capacity, knowledge and skills of midwives. Coordinating role of regulatory body and health authorities.	Michel-Schuldt M, Dayon MB, Klar RT, Subha M, King-Lincoln E, Kpangbala-Flomo C et al. Continuous professional development of Liberia's midwifery workforce - a coordinated multi-stakeholder approach. Midwifery. 2018;62;77-80.
Supporting evidence												

A2. Supporting evidence

Barrett FA, Lipsky MS, Lutfiyya MN. The impact of rural training experiences on medical students: a critical review. Acad Med. 2011;86(2):259-263.
Brodribb W, Zadoroznyj M, Martin B. How do rural placements affect urban-based Australian junior doctors' perceptions of working in a rural area? Aust Health Rev. 2016;40(60:655-660.
Harmon LM. Rural model dedicated education unit: partnership between college and hospital. J Contin Educ Nurs. 2013;44(2):89-96.
Lee M, Newton H, Smith T, Crawford M, Kepley H, Regenstein M, et al. The benefits of physician training programs for rural communities: lessons learned from the Teaching Health Center Graduate Medical Education Program. J Health Care Poor Underserved. 2016;27(4a):83-90.
Lyle D, Greenhill J. Two decades of building capacity in rural health education, training and research in Australia: university departments of rural health and rural clinical schools. Aust J Rural Health. 2018;26(5):314-22.
Mitra G, Gowans M, Wright B, Brenneis F, Scott I. Predictors of rural family medicine practice in Canada. Can Fam Phys. 2018;64(8):588-596.
O'Sullivan BG, McGrail M, Russell D, Chambers H, Major L. A review of characteristics and outcomes of Australia's undergraduate medical education rural immersion programs. Hum Resour Health. 2018;16:8.
Rourke J, Asghari S, Hurley O, Ravalia M, Jong M, Parsons W et al. From pipelines to pathways: the Memorial experience in educating doctors for rural generalist practice. Rural Remote Health. 2018;18:4427.
Slagle DR. Recruitment and retention strategies for hospital laboratory personnel in urban and rural settings. Clin Lab Sci. 2013;26(1):10-14.
Farmer J et al. A scoping review of the association between rural medical education and rural practice location. Supportive evidence. Human Resources for Health (2015) 13:27

A3. Supporting evidence

Bentley M, Dummond N, Isaac V, Hodge H, Walters L. Doctors' rural practice self-efficacy is associated with current and intended small rural locations of practice. Aust J Rural Health. 2019;27(2):146–152.
Amalba A et al., The Role of Community-Based Education and Service (COBES) in Undergraduate Medical Education in Reducing the Mal-Distribution of Medical Doctors in Rural Areas in Africa: A Systematic Review, Health Professions Education

A4. Supporting evidence

Bailey N, Mandeville KL, Rhodes T, Mipando M, Muula AS. Postgraduate career intentions of medical students and recent graduates in Malawi: a qualitative interview study. BMC Med Educ. 2012;12:87.
Williams EN, McMeeken JM. Building capacity in the rural physiotherapy workforce: a paediatric training partnership. Rural Remote Health. 2014;14:2475.

A5. Supporting evidence

Shah R, Munis M, Winch P, Mullany L, Mannan I, Rahman S et al. Community-based health workers achieve high coverage in neonatal intervention trials: a case study from Sylhet Bangledesh. J Health Popul Nutr. 2010;28(6):610-618.
Zambrano LI, Pereyra-Elias R, Reyes-Garcia SZ, Fuentes I, Mayta-Tristan P. Influence of parental education on Honduran medical student's labour perspectives: rural work and emigration. Can J Rural Med. 2015:20(4):121-128.
Puddey IB, Playford DE, Mercer A. Impact of medical student origins on the likelihood of ultimately practicing in areas of low vs high socio-economic status. BMC Med Educ. 2017;17(1).
Smedts AM, Campbell N, Sweet L. Work-integrated learning (WIL) supervisors and non-supervisors of allied health professional students. Rural Remote Health. 2013;13(1):1993.

REGULATORY EVIDENCE PROFILES

Quality assessment									Summary of findings			Reference
No. of studies	**Health worker occupation(s)**	**Design**	**Limitations**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Quality of evidence**	**No. of participants/sample size**	**Was there a control group?**	**Reported effects/outcomes**	
B1. Introduce and regulate enhanced scopes of practice in rural and remote areas to increase the potential for job satisfaction, thereby assisting recruitment and retention												
Availability (as measured by percentage of health workers retained in rural area)												
1	Doctors, Canada	Qualitative, collective case study design	Selected by word of mouth, no additional audit for clarification/checking.	None identified	None identified	Unclear	None identified	Very low	4 rural communities (cases) in Alberta that retained family doctors for 4 years or longer	No	Doctos' decisions to stay in a particular community were commonly influenced by: supply of doctors, occupational dynamics, scope of practice and practice set-up across all communities, while innovation, management and support emerged from some communities. Rural retention was enhanced by the oppourtunity to offer rural general practice and the job satisfaction derived from this, as opposed to more constrictive positions in family practice offered in cities.	Cameron PJ, Este DC, Worthington CA. Professional, personal and community: 3 domains of physician retention in rural communities. Can J Rural Med. 2012;17(2):47-55.
1	Nurses, Australia	Mixed methods cross-sectional study: focus group and survey questionnaires	None identified	None identified	None identified	Small sample size	None identified	Very low	32	No	Created an enhanced scope of practice as advanced rural nursing. Advanced nursing course was perceived by participants to extend their role in patient care, with an increase in job satisfaction, plus self-perceived increase in clinical skills.	Cant R, Birks M, Porter J, Jacob E, Cooper S. Developing advanced rural nursing practice: a whole new scope of responsibility. Collegian. 2011;18(4):177-182.
1	Community health aides and community health practitioners (CHA/Ps), United States of America	Qualitative study: participants interviewed about their scope of practice, interactions with mothers, infants, families and teens	None identified	None identified	None identified	Small sample size	None identified	Very low	6	No	CHA/Ps are often sole medical workers in their communities providing essential services, including acute, chronic, preventive and emergency care, in addition to administrative and medication-related tasks. The CHA/Ps provide "culturally sensitive services" and perpetuate traditional knowledge transmission. Due to their pivotal role in their communities, CHA/Ps often offer their services as the on-the-ground health care expert both day and night. The holistic scope of work that CHA/Ps provide to support mothers is "pretty comprehensive".	Chernoff M, Cueva K. The role of Alaska's tribal health workers in supporting families. J Community Health. 2017;42(5):1020-1026.
28	Rural physician assistants (PAs) and nurse practitioners, United States of America	Sytematic review over period of 35 years. Broad - 17 surveys, 8 interviews/focus groups and 4 secondary analyses of large databases. A few of the papers overlapped in methodology (e.g. survey and interview). The manuscripts were published in peer-reviewed journals.	None identified	None identified	None identified	None identified	None identified	Very low	28	Yes, comparison group of urban PAs	Due to the higher needs and demands in rural areas, rural PAs spend more time with patients clinically, see more patients on a daily basis, and have more patients for whom they are the principal provider. The most common type of practice for a rural PA is primary care. Recruitment, retention and job satisfaction correlate with a broad scope of practice and moderate degree of autonomy.	Henry LR, Hooker RS, Yates KL. The role of physician assistants in rural health care: a systematic review of the literature. J Rural Health. 2011;27(2):220-229.
Competence												
Responsiveness												
Unintended effects												
1	Doctors (anaesthetiologists), West Africa	Retrospective quantitative cross-sectional audit	Serious limitations	None identified	None identified	None identified	Large magnitude of effect	Low	303 (97%) of 311 were traced	No	West Africa College of Surgeons provided an 18-month diploma course with the aim to train rural mid-level anaesthetists. 80% were still practising anaesthesia, 5% were in other disciplines. While 69 (22.7%) were abroad: 35 (11.5%) in the United Kingdom, 21 (6.9%) in USA, 4 (1.3%) in Canada. Only 9% of diploma holders remained in rural communities (as originally envisaged), 31% were consultants (as fellows) and 30% were registrars in fellowship training. The programme did not appear to have achieved the objectives of meeting rural middle-level human resources in anaesthesia as envisaged.	Bode CO, Olatosi J, Amposah G, Desalu I. Has the middle-level anaesthesia manpower training program of the West African College of Surgeons fulfilled its objectives? Anaesth Intensive Care. 2013;41(3):359-362.

B2. Introduce different types of health workers with appropriate training and regulations for rural practice in order to increase the number of health workers in rural and remote areas												
Quality assessment									**Summary of findings**			**Reference**
No. of studies	**Health worker occupation(s)**	**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 of health workers working in rural areas retained after graduation)												
1	Hospitalists in small rural hospitals, United States of America	Cross-sectional survey	No serious limitation	None identified	Inference	No hard data of numbers retained	Response from administrators, no response from patients/communities	Low	350 small rural hospitals, high response rate 86.4%	Yes	73.6% reported increased recruitment and retention. Improved quality of care. Patient satisfaction increased with hospitalists living in the community.	Casey MM, Hung P, Moscovice I, Prasad S. The use of hospitalists by small rural hospitals: results of a national survey. Med Care Res Rev. 2014;71(4):356-366.

1	Community-based health volunteers (CBHV), Ghana	Cross-sectional: interviews	None identified	None identified	None identified	None identified	None identified	Low	32	Yes, interviews from 31	Logistical supplies, incentives, respect and support from community members and recognition and support from health worker supervisors help reduce attrition 44% (31) drop-out rate. CBHV have a variety of roles improving health in communities: promote healthy behaviours, prevent disease, case manage sick children, increase health literacy of community, parenting skills, and targeted programmes, e.g. elephantiasis, malaria, TB.	Chatio S, Akweongo P. Retention and sustainability of community-based health volunteers' activities: a qualitative study in rural Northern Ghana. PLoS ONE.
1	Community health worker aide (CHA) and community health practititioner (CHP), United States of America	Retrospective observational	No serious limitation	None identified	None identified	None identified	Potential of community health workers in Polar regions	Moderate	47 370	No	CHA/Ps provide a broad range of primary care in remote Alaskan communities whose residents would otherwise be without consistent medical care. Alaska's CHA/P programme could serve as a health care delivery model for other remote communities with health care access challenges.	Golnick C, Asay E, Provost E, Van Liere D, Bosshart C, Rounds-Riley J et al. Innovative primary care delivery in rural Alaska: a review of patient encounters seen by community health aides. Int J Circumpolar Health. 2012;71:18543.
1	Doctors, medical aid workers, Brazil	Observational study	Regional inequities and uptake of programme	None identified	None identified	None identified	Magnitude of effect	Moderate	14 168 (68% of municipalities)	No	Reduction in shortfall of doctors for areas of need identified in regional areas. An overall increase in access to primary health care for areas in need was seen. No retention data have been reported.	Oliveira JP, Sanchez MN, Santos LM. The Mais Medicos (More Doctors) Program: the placement of physicians in priority municipalities in Brazil from 2013 to 2014. Ciencia & Saude Coletiva. 2016;21(9):2719-2727.
1	Doctors, nurses, auxiliary nurse mid-wives, in service specialists, India	Qualitative, semi-structured interviews	Serious limitations	None identified	None identified	None identified	None identified	Low	82	Yes, permanent positions vs contractural	The introduction of contracted health workers has temporarily bridged the gap in human resources (recruitment) which increased from 24.8% to 33.8% in 7 years, but insufficient attention was paid to issues impacting retention. Rural background and community attachments were strongly associated with health workers' decision to join rural service, regardless of occupation or contract. However, this was challenged by poor working and living conditions, low salary and incentives, and lack of professional growth and recognition. Each occupation revealed different negative factors, including: lack of pay parity and job security, irrational postings, and political interference.	Rajbangshi PR, Nambiar D, Choudhury N, Rao KD. Rural recruitment and retention of health workers across cadres and types of contract in north-east India: a qualitative study. WHO South-East Asia J Public Health. 2017;6(2):51-59.
Competence												
Unintended effects												
1	Community midwives, Pakistan	Qualitative research, purposive sampling with content analysis of focus group discussions	No serious limitation	None identified	None identified	None identified	None identified	Low	19 focus groups, 72 participants	No	Community midwives are struggling for survival in rural areas as maternal care providers as they are inadequately trained, lack resources to deliver services in their catchment areas and lack facilitation for integration in district health system.	Sarfraz M, Hamid S. Challenges in delivery of skilled maternal care - experiences of community midwives in Pakistan. BMC Pregnancy Childbirth. 2014;14:59.

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 workers in these areas

Quality assessment									Summary of findings			Reference
No. of studies	**Health worker occupation(s)**	**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 of doctors retained after their compulsory period in a rural area)												
70	All health workers, 70 countries	Review, questionnaire	Very serious limitations	None identified	Different models of interventions	None identified	Potential for magnitude of effect	Very low	70 countries	No	Most programmes had limited evidence of outcomes. In Puerto Rico, pre-programme, 16/78 areas had no doctors, but after programme, all had doctors. In South Africa, programme led to better staffing in hospitals, shorter waiting times, more frequent outreach visits. In Indonesia it led to increased new doctors' willingness to work rurally.	Frehywot S, Mullan F, Payne PW, Ross H. Compulsory service programmes for recruiting health workers in remote and rural areas: do they work? Bull World Health Organ. 2010;88(5):364-370.
1	Doctors, Brazil	Quantiative study	No serious limiations	None identified	None identified	None identified	The observed reduction of scarcity, and or intensity, could have been greater if the soioeconomic shortfalls and health needs had been reduced in the period.	Moderate	5562 municiplaities	No	A substantial increase in the supply of doctors in primary health care during this period, which helped reduce the number of municipalities with shortages from 1200 (24%) to 777 (14%). Patients reported to administrators: reduced waiting time; increased care during consultation; continuity of treatment; increased diagnosis of problems locally.	Girardi SN, Stralen AC, Cella JN, Wan Der Maas L, Carvalho CL, Faria Ede O. Impact of the Mais Medicos (More Doctors) Program in reducing physician shortage in Brazilian Primary Healthcare. Ciencia & Saude Coletiva. 2016;21(9):2675-2684.

1	Doctors and dentists, South Africa	Quantitative cross-sectional survey	Serious limitations	None identified	None identified	None identified	Demographic and data collection hindrances	Low	685	No	Rural placement during compulsory community service programme is more likely for unmarried, male and black medical officers. Only 25% indicated continuing to work in rural areas. However, those who undertook their community service placement in rural facilities indicated higher intentions of continuing rural placement location.	Hatcher AM, Onah M, Kornik S, Peacocke J, Reid S. Placement, support, and retention of health professionals: national, cross-sectional findings from medical and dental community service officers in South Africa. Hum Resour Health. 2014;12:14.
1	Doctors, Philippines	Cohort study mixed methods: review of technical and grey material	Serious limitations	None identified	None identified	Incomplete contact details - only 26/452 former doctors interviewed	None identified	Very low	97	No	18% stayed. Study reveals factors in decision-making; suggests novel retention strategies and identifies key aspect of ongoing nature and importance of government relations and the existence of the programme itself to advocate for rural doctor retention.	Leonardia JA, Prytherch H, Ronquillo K, Nodora RG, Ruppel A. Assessment of factors influencing retention in the Philippine National Rural Physician Deployment Program. BMC Health Serv Res. 2012;12:411.
1	Doctors, Bangladesh	Qualitative study	Diversity of participants	None identified	None identified	None identified	None identified	Very low	11	No	Implementation of policy for recruitment, compulsary service and strategies to retain doctors were often not well enacted which contribute to ongoing failures in retaining rural doctors.	Joarder T, Rawal LB, Ahmed SM, Uddin A, Evans TG. Retaining doctors in rural Bangladesh: a policy analysis. IJHPM. 2018;7(9):847-58.
1	Doctors, South Africa	Consecutive cross-sectional descriptive study design	Lack of data prior to 2009 about those who received a study bursary. Substantial response bias and self-reported, unsubstantiated responses.	None identified	Changes in the survey tool over 15 years introduced some variations	None identified	None identified	Low	15 000+ medical graduates	No	The attitude of the majority of respondents towards compulsory service (CS) shifted significantly from neutral to positive over the course of the 15 years. In terms of future career plans, 50% hoped to specialize, a decreasing minority to go overseas or into private practice, and a constant 15% to work in rural or underserved areas. The primary objective of CS, to improve the distribution of health professionals throughout the country, has been partially achieved, as rural placements have increased to ~50%, but not to the extent of the relative need in rural provinces. The CS workforce is a reliable recruitment strategy, bringing 8000 fresh young graduates into the public service each year to fill posts vacated by their predecessors, but the temporary contract nature of these posts creates a situation of constant staff turnover and does little to create a stable long-term workforce.	Reid S, Peacooke J, Kornik S, Wolvardt G. Compulsory community service for doctors in South Africa: a 15-year review. S Afr Med J. 2018;108(9):741-748.
Competence												
Unintended effects: dissatisfaction over clinical supervision and work environment in rural areas												
1	GP registrars, Australia	Observational qualitative, cross-sectional study	Some serious limitations	None identified	None identified	Response rate not known	None identified	Low	15 participants undertook in-depth interviews	No	Though generally rewarding clinical learning experience, negative aspects of the rural placement included the disruption to personal lives of rural relocation and the stresses involved in the higher levels of clinical responsibility. These stressors could undermine rather than enhance clinical confidence. Anxiety and depression were accompaniments for some registrars. Intention to practise rurally was little influenced by this compulsory placement.	Bayley SA, Magin PJ, Sweatman JM, Regan CM. Effects of compulsory rural vocational training for Australian general practitioners: a qualitative study. Aust Health Rev. 2011;35(1):81-85.

B4. Provide scholarships, bursaries or other education subsidies with enforcable 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	**Health worker occupation(s)**	**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 doctor density)												
1	Doctors, Canada	Observational retrospective audit	Serious limitations	None identified	None identified	None identified	Magnitude of effect	Low	Part 1: 139 doctors. Part 2: 60 doctors with return for service (RFS) and 67 non-RFS doctors	No	Part 1: proportion of RFS doctors who completed service obligations was 71.6%. Part 2: RFS doctors were 3.2% less likely to leave province than non-RFS doctors. A chi-squared test confirmed that RFS doctors worked longer in the province than non-RFS doctors (chi-squared = 7.678, p = 0.006).	Mathews M, Heath SL, Neufeld SM, Samarasena A. Evaluation of physician return-for-service agreements in Newfoundland and Labrador. Healthcare Policy. 2013;8(3):42-56.
1	Allied health workers, Australia	Mixed method quantitative data analysis and qualitative in-depth interviews	Number of respondents	None identified	None identified	Number of respondents	None identified	Low	146, 17 interviewed, 11 managers	No	The study found good general support for the scholarships. The majority of scholarship recipients had completed their bonded service requirement, and most reported they would have gone into rural practice anyway. Several aspects of professional support were identified as necessary for retention.	Devine SG, Williams G, Nielsen I. Rural allied health scholarships: do they make a difference? Rural Remote Health. 2013;13(4):2459.
Competence												
Responsiveness (measured as the variable themes impacting on reasons for recruitment and retention)												

1	Nurses, Canada	Retrospective qualitative oral history study	Serious limitation	None identified	None identified	None identified	None identified	Low	41 nurses interviewed	No	The data analysis identified predominant themes and subthemes from the interviews. These were complex and unique to this group of nurses. Travel opportunities and initial salaries were better but in later years this was not a motivating factor. Predominant themes include: finding out about work in NL; the immigration process; incentives; first impressions; adaptation to the work environment; adaptation to the NL culture and lifestyle. Many of the participants opted to stay because they married local men; however, many had also developed strong feelings about NL. Although the immigrant nurses encountered challenges in the workplace and with the lifestyle and culture, they adapted and stayed, in most cases spending their entire career serving the people of NL.	Beaton M, Walsh J. Overseas recruitment: experiences of nurses immigrating to Newfoundland and Labrador, 1949-2004. Nurs Inq. 2010;17(2):173-183.
1	Doctors, dentists and other health workers, USA	Retrospective cohort study	Serious limitation	None identified	None identified	None identified	Different types of loan repayments	Low	122	Urban comparison group	Loan repayment programmes (LRPs) only have a limited influence on the recruitment and retention of providers to rural Colorado; they do influence choice of specific rural community. 11 (41%) of rural participants who stayed in rural communities said the LRP was an important factor in staying; however, 21 (66%) of the rural participants said they were planning on practising in a rural area regardless of whether they received loan repayment.	Renner DM, Westfall JM, Wilroy LA, Ginde AA. The influence of loan repayment on rural healthcare provider recruitment and retention in Colorado. Rural Remote Health. 2010;10(4):1605.
Unintended effects												
1	Health officials, health workers, including senior county health officials, hospital directors, senior and junior doctors, nurses, service users (patients), China	In-person interviews	None identified	None identified	None identified	None Identified	None identified	Low	8 health officials, 80 health workers, 80 service users	No	Mandatory rural bonded scholarships are much more likely to influence rural retention in countries where conformity to prescribed behaviour is strong and legal contracts are enforced.	Zhou XD, Li L, Hesketh T. Health system reform in rural China: voices of healthworkers and service-users. Soc Sci Med. 2014;117:134-141.

Supporting evidence

Bhatia S, Purohit B. What motivates government doctors in India to perform better in their job? J Health Manage. 2014;16(1):149-159.

Humphreys J, Wakeman J, Wells B, Lenthall S, Worley P. The rural and remote health policy impasse - why hasn't research evidence generated policies to improve rural and remote health services? Colloquium, 6th Rural and Remote Health Scientific Symposium - Outback infront: 20 years of rural and remote health research, 11-12 April, 2018, Canberra.

Mboineki JF, Zhang W. Healthcare provider views on transitioning from task shifting to advanced practice nursing in Tanzania. Nurs Res. 2018;67(1):49-54.

Ravaghi H, Taati E, Abdi Z, Meshkini A, Sarvarizadeh S. Factors influencing the geographic distribution of physicians in Iran: a qualitative study. Rural Remote Health. 2015;15(1).

Seshadri SR, Parab S, Kotte S, Latha N, Subbiah K. Decentralization and decision space in the health sector: a study from Karnataka, India. Health Policy Plan. 2016;31(2):171-181.

Smith T, McNeil K, Mitchell R, Boyle B, Ries N. Exploring factors affecting update of extended scope of practice in rural areas. Peer-reviewed paper presented at 14th National Rural Health Conference, 26-29 April 2017, Cairns.

Vong S, Raven J, Newlands D. Internal contracting of health services in Cambodia: drivers for change and lessons learned after a decade of external contracting. BMC Health Services Research. 2018;18(1):375.

Jing L, Liu K, Zhou X, Wang L, Huang Y, Shu Z et al. Health-personnel recruitment and retention target policy for health care providers in the rural communities: a retrospective investigation at Pudong New Area of Shanghai in China. IJHPM. 2019;34(1):e157-e167.

FINANCIAL INCENTIVES EVIDENCE PROFILES

C1. Use a combination of fiscally sustainable financial incentives, such as hardship allowances, grants for housing, free transportation, paid vacation 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	Health worker occupation(s)	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, proportion of health workers recruited to rural area, measured as retention rates)												
1	Doctors in training, Israel	Mixed methods: pre- and post-incentive data analysis with surveys	Confounders from rural background and increased residency training programmes	None identified	Not suspected	None identified	The impact of the incentives could not be calculated precisely. A significant portion of doctors who did not have an early preference to work in the periphery found the incentives influenced their decision. Intention to continue working peripherally was high.	Moderate	1042 hospital residents - all the residents in perpheral areas in which a grant was given (352 residents) and a random sample of residents in central hospitals (690).	Pre-incentive years used as control, but likelihood of choosing peripheral residency was not calculated compared with post-incentives.	Residents in peripheral hospitals constituted 16–20% of the total in 2005–2010, 19% in 2011, 23% in 2012, and 23% in 2013; the increase consisted predominantly of doctors who were graduates of non-Israeli medical schools. Half of all residents in the periphery reported that the incentives contributed to their choice of residency location. About 40% of that group also reported that they had planned already in medical school to practicse in the periphery, while 60% of that group (30% of all residents in the periphery) had no such plans prior to medical school. About 70% of the residents in peripheral hospitals grew up in the periphery; for the southern periphery this was 40% and for the northern periphery this was 80%. Incentives targeted to increase supply and demand.	Ashkenazi Y, Gordon M, Rosen B. Using financial incentives to attract medical residents to the periphery: the Israeli experience. Health Policy. 2019;123(1):80-86.
1	Health workers, Indonesia	Quantitative policy report	Serious limitations: no management of confounders	None identified	Conclusions in "lessons learned" do not appear to be directly related to evidence presented.	No quantification of outcomes	Magnitude of effect versus policy	Very low	32 978	No	Most of the targeted programmes used financial incentives. Various policies have succeeded in improving unbalanced distribution and shortage of health workers in Indonesia's remote and very remote areas.	Efendi F. Health worker recruitment and deployment in remote areas of Indonesia. Rural Remote Health. 2012;12:2008.
1	Health workers, India	Mixed methods cross-sectional study: purposive sampling, semi-structured and open-ended questionnaire, key informant interviews, thematic analysis of documents	Lacked details	None identified	None identified	None identified	None identified	Low	12 health facilities, 6 CHCs, 4 PHCs, 2 district hospitals in 3 districts: 57 respondents	Comparison group	1319 health workers, including doctors, retained 2010-11, reducing vacancies of doctors from 90% to 45%; number increased to 1658 in 2011-12; 20% increase in staff, increase in uptake of scheme, 92.5% of facilities classified as "most difficult" reduced to 30.6% in 2011.	Lisam S, Nandi S, Kanungo K, Verma P, Mishra JP, Mairembam DS. Strategies for attraction and retention of health workers in remote and difficult-to-access areas of Chhattisgarh, India: do they work? Indian J Public Health. 2015;59(3):189.
1	Allied health workers, United Kingdom	Mixed methods: semi-structured interviews and survey questionnaire with thematic analysis of managers, recruits and teams	A longitudinal design would have been preferred	None identified	None identified	Unclear	None identified	Very low	66	No	Positive outcome, although 42% claimed the financial allowance had no influence; the secondary benefits did - limited use of funds for what they wanted, e.g. continuing professional development, new equipment, etc. For those that did not stay, promotion was the main reason for leaving. More benefits than just recruitment, few negative impacts.	Solowiej K, Upton P, Upton D. A scheme to support the recruitment and retention of allied health professionals to hard to fill posts in rural areas. Int J Ther Rehabil. 2010;17(10):545-553.
1	Doctors, Chinese medicine physicians, dentists, China	This study has employed an interrupted trend analysis with time series observations for 32 years	Although improved distribution across the board, insufficient detail to provide specific improvements/continued maldistribution in some rural and remote areas.	None identified	Lack of data on different types of specialists. There are also differences in the types of cases managed by Western and traditional medicical practitioners.	None identified	None identified	Moderate	Not specified	No	NHIs offering universal health coverage to all citizens and proper financial incentives to providers resulted in more equal geographic distributions among all three groups: mandatory enrolment for all citizens, government run insurer, single payer, comprehensive benefit coverage for all 3 groups, and high rate of registration of health providers.	Yang CH, Huang YTA, Hsueh YSA. Redistributive effects of the national health insurance on physicians in Taiwan: a natural experiment time series study. Int J Equity Health. 2013;12(1).

1	Doctors - GPs, Australia	Database analysis	Serious limitation	None identified	The newly eligible areas were likely to be larger regional towns, rather than very remote locations. Incentives changed.	None identified	Large effect	Moderate to Low	2008-2014, 21 000 to 24 000 GPs in each year period	The differences in differences were compared across the years before and after the policy change	There was a substantial increase in entries of newly qualified GPs to areas newly eligible for the incentive payments; overall GP numbers increased from 21 000 to 24 000 in 5 years after intervention. A difference-in-differences approach was used to examine if the policy change affected GP entry or exit to the 755 newly eligible locations and the 787 always eligible locations relative to 2249 locations which were never eligible. The policy change increased the entry of newly qualified GPs to newly eligible locations but had no effect on the entry and exit of other GPs. The results suggest that location incentives should be targeted at newly qualified GPs. However, total stock relative to metropolitan areas remained constant.	Yong J, Scott A, Gravelle H, Sivey P, Mcgrail M. Do rural incentives payments affect entries and exits of general practitioners? Soc Sci Med. 2018;214:197–205.
57	Community midwives, Pakistan	Asset-based qualitative decriptive interviews; institutional ethnography	Serious limitations, not a representative sample	Variability of interviewee backgrounds and expertise	Variance of practice resources for each clinician	None identified	Not generalizable to other populations	Very low	38 CMWs, 45 other health professionals, 20 policy-makers, 78 women, 35 husbands, 23 older women	No	Maternity workers not perceived as valuable - low-caste status. Single, older, high financial need status were motivators for successful maternity practice. Skills in networking, business, professionalism and non-judgemental communication were factors predicting success.	Mumtaz Z, Levay AV, Bhatti A. Successful community midwives in Pakistan: an asset-based approach. PLoS ONE. 2015;10(9).
Responsivenes												
Unintended effects (measured as dissatisfaction over amount, implementation or classification of who is entitled to the finacial incentive/desire to quit)												
1	Phase 1 - doctors; Phase 2 - all health workers, Zambia	Cross-sectional mixed methods study	None identified	None identified	Hugely variable, health workers surveyed	None identified	None identified	Low	234 health workers, in 3 districts, (benefit goes to 624 health workers in 41 districts)	No	Although there was an increase in health care service providers where previously there had been no service, 40% of responders have low or very low job satisfaction, 48% desire to quit working in current location - of these 33% to private, 26% outside Zambia, 19% to local NGO facilities. The Logit model showed housing allowance reduces desire to quit. Suggestions made for non-finacial supports.	Gow J, George G, Mwamba S, Ingombe L, Mutinta G. An evaluation of the effectiveness of the Zambian Health Worker Retention Scheme (ZHWRS) for rural areas. Afr Health Sci. 2013;13(3):800-807.
1	Health workers, Kenya	Cross-sectional survey	Very serious limitations: small sample size, response bias likely	None identified	None identified	None identified	None identified	Very low	38	No	65.7% reported a negative impact on family life; and same number received hardship allowances. Lack of amenities and resources provided for workers. A general lack of organization/harmonization of services, utilities and incentives was seen.	Njuguna J, Mwangi P, Kamau N. Incentives among health workers in a remote Kenyan district: implications for proposed county health system. J Health Care Poor Underserved. 2014;25(1):204-214.
1	Health workers and district managers, United Republic of Tanzania	Observational study, mixed methods	Various resource limitations	None identified	None identified	None identified	None identified	Very low	101 health workers, 75 facilities, 40 interviews and 4 focus group discussions	No	Only 7% were satisfied with salary/employment benefits: less than 20% of facilities had adequate resources availability; less than 40% reported satisfaction with access to utilities and appropriate facilities; also barriers of community attitudes. Contextual issues are critical: basic infrastructure, minimum number of staff with appropriate education and skills, and sufficient resources.	Olafsdottir AE, Mayumana I, Mashasi I, Njau I, Mamdani M, Patouillard E et al. Pay for performance: an analysis of the context of implementation in a pilot project in Tanzania. BMC Health Serv Res. 2014;14.
5	CHWs, Nepal, Bangladesh, India, Islamic Republic of Iran, Ethiopia	Mixed method case studies review and comparison	Lack of detailed analysis, with reported confounders of training, employment type	Indirect, paradoxes detailed in results	None identified	Paradoxes detailed in results	None identified	Low	5 case studies	No	All of the programmes had high retention rates and contributed in different ways to improving health outcomes in the communities they were working. Both full-time and volunteer CHWs can become demotivated if they do not have access to adequate training, quality supervision, community acceptance or appreciation, or if they are expected to work longer hours than they can realisitically manage while fulfilling their other commitments. Full-time paid CHWs can further lose motivation if their allowances are not provided in a timely fashion. Time-consuming means to raise funds, such as the sale of commodities, can prevent part-time CHWs, who have many other responsibilities from focusing on health issues. The use of gifts and community appreciation seems to be of value to all CHWs.	Singh D, Negin J, Otim M, Orach CG, Cumming R. The effect of payment and incentives on motivation and focus of community health workers: five case studies from low- and middle-income countries. Hum Resour Health. 2015;13:58.
1	Village doctors, China	Qualitative study with in-person interviews conducted August 2013 - January 2014	None identified	None identified	Unclear	None identified	None identified	Very low	49	No	Health reforms, particularly around prescribing practices, resulted in reductions in doctors income and independence, compromising incentives to serve rural areas.	Zhang S, Zhang W, Zhou H, Xu H, Qu Z, Guo M et al. How China's new health reform influences village doctors' income structure: evidence from a qualitative study in six counties in China. Hum Resour Health. 2015;13:26.

Supporting evidence

Blaauw D, Erasmus E, Pagaiya N, Tangcharoensathein V, Mullei K, Mudhune S et al. Policy interventions that attract nurses to rural areas: a multicountry discrete choice experiment. Bull World Health Organ. 2010;88(5):350-356.
Cooke R, Couper I, Versteeg M. Human resources for rural health. S Afr Health Rev. 2011;2011(1):107-117.
Harris M. Payment for performance in the family health programme: lessons from the UK quality and outcomes framework. Rev. Saude Publica. 2012;46(3):577-582.
Keuffel E, Jaskiewicz W, Theppanya K, Tulenko K. Cost-effectiveness of rural incentive packages for graduating medical students in Lao PDR. IJHPM. 2017;6(7):383-94.
Misfeldt R, Linder J, Lait J, Hepp S, Armitage G, Jackson K et al. Incentives for improving human resource outcomes in health care: overview of reviews. J Health Serv Res Policy. 2014;19(1):52-61.
Munga MA, Torsvik G, Maestad O. Using incentives to attract nurses to remote areas of Tanzania: a contingent valuation study. Health Policy Plan. 2014:29(2):227-236.
Ly BA, Bourgeault IL, Labonte R, Niang MN. Physicians' perceptions on the impact of telemedicine on recruitment and retention in underserved areas: a descriptive study in Senegal. Hum Resour Health. 2017;15(1):67.

SUPPORT STRATEGIES EVIDENCE PROFILES

Quality assessment									Summary of findings			Reference
No. of studies	**Health worker occupation(s)**	**Design**	**Limitations**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Quality of evidence**	**No. of participants/sample size**	**Was there a control group?**	**Reported effects/outcomes**	
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												
Availability (measured as perceived/reported impact on attractiveness of rural post)												
1	CHWs (volunteers), Uganda	Mixed methods: semi-structured interviews	Geographic diversity and sample size, monetary incentive to complete survey may have skewed results to those wanting payment	None identified	None identified	None identified	None identified	Low	134	No	Village health teams desire support in the form of payment, supplies and respect from their community and other health workers. Anticipated longevity was positively associated with stronger partnerships with local health centre staff and ease of home visiting.	Mays DC, O'Neil EJ Jr, Mworozi EA, Lough BJ, Tabb ZJ, Whitlock AE et al. Supporting and retaining village health teams: an assessment of a community health worker program in two Ugandan districts. Int J Equity Health. 2017;16(1):129.
Competence												
-												
Responsiveness												
-												
Unintended effects												
-												

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 rural and remote areas

Quality assessment									Summary of findings			Reference
No. of studies	**Health worker occupation(s)**	**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 in likelihood of job turnover intentions)												
1	CHWs, Ghana	Mixed methods: interviews with semi-structured questionaire, focus groups discussion and field trip notes and reports data analysis	No previous attrition rate for CHWs known for Ghana so inter-country comparison from similar programmes used.	None identified	None identified	None identified	Community involvement in selection. High magnitude of effect.	Moderate	660 CHWs over 30 months, n=520 interviews, n=5 focus groups ~12 000 children	No	Attrition rate 21.2% = 140 (low, other countries CHW attrition rates in similar programmes range from 70-30%) during the 30-month trial. 30% reduced mortality in children < 5 years old with fever treated with artesunate +amodiaquine, and 44% reduction with addition of amoxicillin. Negative attitudes of caregivers caused some CHWs to exit, e.g. anger from caregiver if ineligible child not given trial medication, mothers shouting at CHW. Technical skills training and community-based programming increased retention.	Abbey M, Bartholomew LK, Nonvignon J, Chinbuah MA, Pappoe M, Gyapong M et al. Factors related to retention of community health workers in a trial on community-based management of fever in children under 5 years in the Dangme West District of Ghana. Int Health. 2014;6(2):99-105.
1	Rural health workers: doctors, nurses, allied health workers and pharmacists, Ghana	Mixed methods: cross-sectional survey and interviews	Majority of health workers were female and nurses. Selection bias - those who did not participate may not have been less motivated and less satisfied. Possible moderacy and social desirability biases on the side of participants.	None identified	None identified	None identified	None identified	Low	256 (41%) out of 626 health workers from 3 districts of the East Region in Ghana	No	Job satisfaction (OR=0.74, 95% CI: 0.57-0.96) and motivation (OR=0.74, 95% CI: 0.60-0.92) were significantly associated with decreased turnover intention and higher levels of both reduced the risk of health workers having this intention. Measure of job satisfaction used is the Job Descriptive Index.	Bonenberger M, Aikins M, Akweongo P, Wyss K. The effects of health worker motivation and job satisfaction on turnover intention in Ghana: a cross-sectional study. Hum Resour Health. 2014;12(43).

1	Nurses, midwives, birth attendants, Burkina Faso	Exploratory qualitative study of a public policy in three remote areas in Burkina Faso	Serious limitations from lack of detailed information on policies	None identified	None identified	None identified	The policy was characterized by the absence of written directives and by targeting only one category of personnel.	Very low	46 interviews with Ministry of Health regional directors, regional human resource managers, district chief medical officers and health workers at primary health centres.	No	Claims that policy implemented over 10 years has been a success.	Kouanda S, Yaméogo WME, Ridde V, Sombié I, Baya B, Bicaba A et al. An exploratory analysis of the regionalization policy for the recruitment of health workers in Burkina Faso. Hum Resour Health. 2014;12(S6).	
1	CHWs, Bangladesh	Qualitative study	No serious limitation	None identified	None identified	None identified	Detailed decision framework developed for plan to stay/go	Low	73 CHWs, including those who had left over the 4-year project.	No	Identified retention factors as financial incentive, feeling needed by the community and the value of the CHW position in securing future career advancement. Challenge for the delivery is the ongoing need and cost of the training programme (6 weeks).	Rahman SM, Ali NA, Jennings L, Seraji MHR, Mannan I, Shah R et al. Factors affecting recruitment and retention of community health workers in a newborn care intervention in Bangladesh. Hum Resour Health. 2010;8(12).	
1	Nurses and midwives, Australia	Pre- and post-intervention design, triangulating data from surveys and archival information	Lower statistical significance in matched group, 30% turnover rate of participants will impact the study	None identified	None identified	None identified	None identified	Moderate	484	No	A system-level intervention was implemented to reduce stress and turnover in two NT hospitals. Nurses in both hospitals showed significant improvement in psychological health outcomes and job satisfaction, and turnover was reduced in Hospital 2 from May 2004 83% to June 2010 33% (statistically significant) and in Hospital 1 from May 2004 46% to June 2010 29% (not significant). Using 17 indicators, and pre- and post-measures, it was concluded that the improved psychological health outcomes could be attributed to the intervention strategy implemented by the NT DoH that included strategies to improve system factors, and reduce job demands and increase job resources.	Rickard G, Lenthall S, Dollard M, Opie T, Knight S, Dunn S et al. Organisational intervention to reduce occupational stress and turnover in hospital nurses in the Northern Territory, Australia. Collegian. 2012;19(4):211-221.	
Competence													
1	GPs, Australia	Longitudinal; quasi-experimental study utilizing an intervenion baseline group and a control group.	Potential biases. Too many factors could influence the decision to leave/or not. Unable to distinguish baseline intention to leave or not versus intention influenced by behavioural coaching.	None identified	Indirect outcome reported	Yes	None identified	Low	intervention group (n=69), baseline group (n=205) and control group (n=312).	Yes, n=312	Cognitive behavioural coaching reduced the stress levels of rural GPs who self-identified the need for managing stress and reduced their intention to leave rural general practice. Further, despite initially being more stressed compared with the general population of rural GPs, more GPs from the coaching group remained in rural practice.	Gardiner M, Kearns H, Tiggemann M. Effectiveness of cognitive behavioural coaching in improving the well-being and retention of rural general practitioners. Aust J Rural Health. 2013;21(3):183-189.	
Responsiveness													
Unintended effects													
1	Community medicine distributors, Uganda	Structured interviews of 100 current CMDs in Tororo district of Uganda	Interviewed the first 5 per parish, convenience sampling may have introduced a selection bias. Snapshot in time when the malaria case management programme had changed.	None identified	None identified	Unclear	The programme's future was uncertain and in transition	Low	100	No	The health workers felt dissatisfied by unrealistic community expectations, limited drugs and supplies, poor supervision compounded by lack of compensation and lack of future paid opportunities.	Banek K, Nankabirwa J, DiLiberto D, Taaka L, Chandler CI, Staedke SG. Volunteer community health workers: temporary fix or long-term solution? Am J Trop Med Hyg. 2010;83(5):388.	
56	Maternal health workers, United Republic of Tanzania	Key informant interviews	Very serious limitations, poor internal controls of those interviewed	None identified	Multiple sources of interviewees	Unclear	None identified	Very low	22	No	Identified importance of organizational structure and accountability, communication, safe mechanism for worker input, available quality housing, equity of compensation for extended duties, effective onboarding, mentorship, adequate suport resources and work environment.	Mkoka DA, Mahiti GR, Kiwara A, Mwangu M, Goicolea I, Hurtig AK. "Once the government employs you, it forgets you": health workers' and managers' perspectives on factors influencing working conditions for provision of maternal health care services in a rural district of Tanzania. Hum Resour Health. 2015;13:77.	

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			
No. of studies	Health worker occupation(s)	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considerations	Quality of evidence	No. of participants/sample size	Was there a control group?	Reported effects/outcomes	Reference
Availability (measured as perceived/reported impact on attractiveness of rural post)												
1	Doctors, midwives, technicians, nurses, Mali	Qualitative study	Small study, semi-structured interviews, face to face - not anonymous	None identified	No direct evidence of impact on recruitment and retention	None identified	None identified	Very low	17	No	Health professionals reported being motivated to work and stay rurally (despite difficulties). Staff perceived benefits of telehealth were new skills, improved service quality, improved patient and staff relationships, and time and money savings. Downsides of telehealth were increased workload and reduced opportunities for external training. The authors surmarized that this could aid retention and recruitment but added no direct evidence of this occurring.	Mbemba GI, Bagayoko CO, Gagnon MP, Hamelin-Brabant L, Simonyan DA. The influence of a telehealth project on healthcare professional recruitment and retention in remote areas in Mali: a longitudinal study. SAGE Open Med. 2016;4:2050312116648047.
Competence												
Responsiveness												
Unintended effects												

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			
No. of studies	Health worker occupation(s)	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considerations	Quality of evidence	No. of participants/sample size	Was there a control group?	Reported effects/outcomes	Reference
Availability (measured as factors that would make a health worker choose a certain job post)												
1	Doctors, Canada	Qualitative, cross-sectional	Bias in self-reporting	None identified	None identified	None identified	None identified	Very low	13	No	The presence of a rural medical campus was perceived as having important impacts on the quality of professional life, research, medical practice and regional development. Increased recruitment and retention of faculty to teach.	Levesque M, Hatcher S, Savard D, Kamyap RV, Jean P, Larouche C. Physician perceptions of recruitment and retention factors in an area with a regional medical campus. Can Med Educ J. 2018;9(1):e74-e83.
Competence												
Responsiveness												
Unintended effects												

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			
No. of studies	Health worker occupation(s)	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considerations	Quality of evidence	No. of participants/sample size	Was there a control group?	Reported effects/outcomes	Reference
Availability (no direct evidence identified)												
Competence												
-												
Responsiveness												
-												
Unintended effects												
-												

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			
No. of studies	Health worker occupation(s)	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considerations	Quality of evidence	No. of participants/sample size	Was there a control group?	Reported effects/outcomes	Reference
Availability (no direct evidence identified)												
Competence												
-												
Responsiveness												
-												
Unintended effects												
-												

Supporting evidence

Albritton T, Martinez I, Gibson C, Angley M, Grandelski VR. What about us? Economic and policy changes affecting rural HIV/AIDS services and care. Soc Work Public Health. 2017;32(4):273-289.
Bazemore AW, Xierali IM, Petterson SM, Philips RL Jr, Rinaldo JCB, Puffer JR et al. American Board of Family Medicine (ABFM) maintenance of certification: variations in self-assessment modules uptake within the 2006 cohort. J Am Board Fam Med. 2010;23(1):49-58.
Blacklock C, Goncalves Bradley DC, Mickan S, Willcox M, Roberts N, Bergstrom A et al. Impact of contextual factors on the effect of interventions to improve health worker performance in Sub-Saharan Africa: review of randomised clinical trials. PLoS ONE. 2016;11(1):e0145206.
Cosgrave C, Hussain R, Maple M. Factors impacting on retention amongst community mental health clinicians working in rural Australia: a literature review. Adv Mental Health. 2015;13(1):58-71.

deValpine MG. Extreme nursing: a qualitative assessment of nurse retention in a remote setting. Rural Remote Health. 2014;14(3):2859. Epub 2014 Jul 24. PMID: 25056367.
Gagnon MP, Breton E, Paré G, Courcy F, Côté J, Trépanier A et al. The impact of information and communication technologies on nurse retention. Sante Publique. 2013;25(3):305-313.
Irving M, Short S, Gwynne K, Tennant M, Blinkhorn A. 'I miss my family, it's been a while...' A qualitative study of clinicians who live and work in rural/remote Australian Aboriginal communities. Aust J Rural Health. 2017;25(5):260-267.
Lemay NV, Sullivan T, Jumbe B, Perry CP. Reaching remote health workers in Malawi: baseline assessment of a pilot mHealth intervention. J Health Commun. 2012;17(S1):105-117.
Li M, Shu Z, Huang X, Du Z, Wu J, Xia Q et al. Capacity evaluation for general practitioners in Pudong new area of Shanghai. Int J Equity Health. 2016;15:192.
Lockyer J, Fidler H, De Gara C, Keefe J. Mentorship for the physician recruited from abroad to Canada for rural practice. Med Teach. 2010;32(8):e322-327.
Müller BS, Falkenhagen N, Wilke D, Gerlach FM, Erler A. Implementierung von Modellen zur Sicherung der Gesundheitsversorgung in ländlichen Regionen: Entwicklung eines Beratungsangebots [Implementation of models to ensure healthcare in rural areas: development of a consultancy service]. Z Evid Fortbild Qual Gesundhwes. 2018;131-132:53-59. doi:10.1016/j.zefq.2018.01.010.
Narayan V, John-Stewart G, Gage G, O'Malley G, “If I had known, I would have applied”: poor communication, job dissatisfaction and attrition of rural health workers in Sierra Leone. Hum Resour Health. 2018;16(1):50.

BUNDLED INTERVENTIONS EVIDENCE PROFILES

Quality assessment									Summary of findings			Reference
No. of studies	Health worker occupation(s)	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considerations	Quality of evidence	No. of participants/sample size	Was there a control group?	Reported effects/outcomes	
E1. Bundled initiatives/integrated evidence A and B												
Availability (as measured by percentage of health workers retained in rural area)												
1	Doctors and nurses, Bangladesh	Qualitative study involving document review, literature review, key informant interviews and round table discussions with stakeholders and policy-makers	Serious limitations	None identified	Does not involve affected occupations directly	None identified	None identified	Very low	11 key informant interviewees, policies over 40 years	No	Bangladesh lacks policies and provision specifically targeted to attraction and retention of HRH in rural health facilities. Admission quotas, rural clinical rotations, additional pay for remote work are having some effect but more effective policies are required.	Rawal LB, Joarder T, Islam SMS, Uddin A, Ahmed SM. Developing effective policy strategies to retain health workers in rural Bangladesh: a policy analysis. Hum Resour Health. 2015;13(1):36.
1	6 health care practitioners (1 clinical psychiatrist, 2 physiotherapists, 1 optometrist, 1 pharmacist, 1 medical officer), South Africa	Unstructured interviews qualitative study using a life history methodology to explore experiences of six rural-origin HCPs working in rural areas.	Serious limitations	None identified	None identified	Small numbers	None identified	Very low	6	No	Recruitment and training of rural scholars is a worthwhile, viable, long-term strategy for the staffing of rural institutions in a developing country such as South Africa; a scholarship scheme can be a successful strategy for both recruitment and retention. These graduates found their work to be both satisfying and enjoyable and were able to provide and extend health care services. They gained status and respect within the community and were role models to scholars in the area. Access to resources improved conditions at home and changed the trajectory of the lives of their family members. However, if such a scheme is to be an effective long-term strategy for the recruitment and retention of HCPs for other rural areas, managers need to invest in the effort of finding and supporting such rural-origin scholars. They also need to give attention to addressing context factors (which lead to frustration) and content factors (that promote motivation) in the workplace.	Ross AJ. Working in rural areas - the experiences of Umthombo Youth Development Foundation graduates. Afr J Prim Health Care Fam Med. 2014;6(1):E1-7.
1	Doctors, multiple African countries	Database review and survey	Survey underpowered, results not statistically significant	None identified	Financial incentive also offered by providing free training along with rural setting. Surgical training in African countries usually requires tuition fees, according to this paper.	Unclear	None identified	Low	Database: 67 graduates; survey: 30 responders	No	100% retention of surgeons in rural African countries and 79% within their home country. PAACS graduates had 51% short-term and 35% long-term (beyond 5 years) rural retention rate. After free rural training via faith-based NGO, training quality appeared good, as evidenced by 1:1 supervisor trainee ratio and good pass rates with COSECSA exams.	Van Essen C, Steffes B, Thelander C, Akinyi K, Li B, Tarpley MJ. Increasing and retaining African surgeons working in rural hospitals: an analysis of PAACS surgeons with twenty-year program follow-up. World J Surgery. 2019;43(1):75–86.
35	Doctors, Brazil	Integrative literature review	Few studies evaluated the impact of PMM on the training of professionals	None identified	None Identified	None identified	Difficulties in organizing the political arrangements necessary for this implementation, or insertion of non-priority areas in the programme.	Low	35 studies	No	In 2012, there were 6948 teams, with a coverage of 77.9% for the municipalities enrolled in the programme. In 2015, there were 8038 teams and a coverage of 86.3% in these municipalities. In this period, with the PMM, the growth in the number of doctors was only less than 10% in five Brazilian schools: Santa Catarina, São Paulo, Rio de Janeiro, Goiás and Pernambu-co. In the context of indigenous health, a national health system involving 613 indigenous people reported that 47% stated that the health team that serves the community did not include a doctor before the start of the PMM. This shows that, even on an emergency basis, this need was met, since, in 2015, the programme was in all the Special Indigenous Health Districts (DSEI) of the country.	Mourão Netto JJ, Rodrigues ARM, Aragão OC, Goyanna NF, Cavalcante AES, Vasconcelos MAS et al. Programa Mais Médicos and its contributions to health in Brazil: integrative review. Rev Panam Salud Publica. 2018;42:e2.
1	Doctors, Brazil	Before-and-after study to evaluate implementation	None identified	None identified	None identified	None identified	None identified	Moderate	1450 remote and deprived municipalities enrolled in the programme	Yes, 258 municipalities that were eligible but not enrolled in the programme	From 2013 and 2015, the programme increased the availability of doctors to remote and deprived populations by 29.8%. Municipalities with <0.4 doctors per 1000 population decreased from 292 to 81.	Santos LMP, Oliveira A, Trindade JS, Barreto IC, Palmeira PA, Comes Y, et al. Implementation research: towards universal health coverage with more doctors in Brazil. Bull World Health Organ [Internet]. 2017 Feb 1 [cited 2020 Oct 6];95(2):103–12. Available from: http://www.who.int/entity/bulletin/volumes/95/2/16-178236.pdf

1	Doctors, Brazil	Analysis of the effectiveness of the PMM in implementing the universal right to health and in consolidating health services networks: analysis of databases, legal documents and field study to evaluate.	None identified	None identified	None identified	None identified	None identified	Moderate	32 municipalities and 16 states in Brazil	Randomized non-enrolled counterfactual group of 258 control municipalities	75% decrease in municipalities with < 1 doctor/1000 population and 20% of population with severe poverty enrolled; reduction from 58 to 2 in the number of municipalities with very low density of doctors, including areas with historically unassisted populations, such as indigenous populations and rural Maroon communities. 1708 municipalities studied, those with ≥ 1 doctor/1000 inhabitants increased from 163 in 2013 to 348 in 2015. Primary health care coverage in enrolled municipalities increased from 77.9% in 2012 to 86.3% in 2015.	Santos WD, Comes Y, Pereira LL, Costa AM, Merchan-Hamann E, Santos LMP. Evaluation of the More Doctors Program: experience report 2019. Saúde em Debate. 2019;43(120).
Competence												
Responsivenes												
Unintended effects												
1	Clinical officers (11), doctors (7), environmental health technologists (9), midwives (14), nurses (40), pharmacist (1), others (13), Zambia	Mixed method: cross-sectional qualitative and quantitative data were collected from health workers and other stakeholders through focus group discussions and individual interview questionnaires and were supplemented by administrative data, district management.	Limited by a small sample size and the cross-sectional nature of the primary data available, but with a great use of confounding factors.	None identified	Indirect outcome	None identified	None identified	Moderate	19 strategies, 45 health workers	No	Results of the quantitative and qualitative analyses suggest there is little association between health worker recruitment and retention strategies in place in Gwembe and Chibombo and health worker recruitment and retention. What relationships may exist seem to be less important to health worker recruitment and retention than individual characteristics of health care workers themselves as well as their living and working conditions, many of which are outside the scope of the recruitment and retention strategies. This suggests that even if existing strategies are reviewed and adjusted, for example, if financial allowances are increased in line with costs of living, efforts to retain and recruit health workers in these areas may be more effective if aspects such as housing, communications, road conditions, and educational opportunities are addressed. The majority of respondents identified the rural hardship allowance as the most effective initiative; no more than 5% of respondents identified any other initiative as most effective.	Goma FM, Murphy GT, MacKenzie A, Libetwa M, Nzala SH, Mbwili-Muleya C et al. Evaluation of recruitment and retention strategies for health workers in rural Zambia. Hum Resour Health. 2014;12(S1).

E2. Bundled initiatives/integrated evidence A, B and C

Quality assessment									Summary of findings			Reference
No. of studies	**Health worker occupation(s)**	**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, proportion of health workers recruited to rural areas)												
1	Doctors, Chile	Retrospective public data analysis of aggregate retention of medical school gradutes in a 3-6 year programme.	Multi-dimensional intervention; no unit record data (only aggregate); no practice outcomes yet.	None identified	Multi-dimensional, multi-year. Varying data system and interventions over time of study.	None identified	None identified	Low	800 over 8 years	No	Results suggest that the programme is successfully attracting doctors to complete obligated work in rural areas. Successful in matching doctors' interests and country's needs for rural doctors. Notably refers to the original review article by Dolea et al (2010).	Pena S, Ramirez J, Becerra C, Carabantes J, Arteaga O. The Chilean Rural Practitioner Programme: a multidimensional strategy to attract and retain doctors in rural areas. Bull World Health Organ. 2010;88(5):371-378.
Competence												
Responsivenes												
Unintended effects												

E3. Bundled initiatives/integrated evidence A, B, C and D

Quality assessment									Summary of findings			Reference
No. of studies	**Health worker occupation(s)**	**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, proportion of health workers recruited to rural areas)												
1	Medical graduates, Thailand	Retrospective study of data from MOPH hospitals	Incomplete data for doctors who are not working in the MOPH. Variation with geographic area and changes introduced over time makes it difficult to correlate intervention with retention.	None identified	Thailand's population not specifically identified as rural, other than in the title and the problem of maldistribution the initiative was trying to address.	None identified	Magnitude of effect	Moderate to low	19 338	Yes	Significant impact on enhancing the retention of doctors working in MOPH health services which serve most of the Thai population. Special recruitment track graduates were more likely to remain working in the MOPH health services than those from the normal track (78.2% and 52.5% respectively $p < 0.05$) and 2.4 times as likely to remain working in MOPH hospitals for a minimum period of 3 years; 90.9% still worked in the province to which they were primarily assigned.	Arora R, Chamnan P, Nitiapinyasakul A, Lertsukprasert S. Retention of doctors in rural health services in Thailand: impact of a national collaborative approach. Rural Remote Health. 2017;17(3):4344.
Competence												
1	Medical students/graduates, Thailand	Observational study; multiple interventions	None identified	None identified	None identified	None identified	Magnitude of effect	Moderate	5926 doctors	No	Targeted strategies and policy interventions implemented to achieve recruitment of rural background, medical training outside capital and major cities, compulsory service requirements in rural and remote areas through two government projects - CPIRD and ODOD - with 92% of medical graduates from this programme remaining in rural areas and likely to remain post-programme. Graduates had increased clinical competency.	Nithiapinyasakul A, Arora R, Chamnan P. Impact of a 20-year collaborative approach to increasing the production of rural doctors in Thailand. Int J Med Educ. 2016;7:414-416.

1	Family doctors, hospital staff, Nepal	Competitive selection for compulsory (3 year) service scholarship and training, living quarters, internet connection, in-service training for all staff and capacity development	None identified	None identified	None identified	None identified	None identified	Moderate	7 programme hospitals, 34 control hospitals	Yes	Between 2011 and 2015 family practice doctors were maintained in all 7 programme hospitals. All hospitals became providers of comprehensive emergency obstetric care and served more patients. Compared with hospitals not within the programme, deliveries increased significantly (203% vs 71% increase, respectively; p = 0.002). Admissions and outpatient visits did not significantly increase. The programme recently expanded to 14 hospitals.	Zimmerman M, Shah S, Shakya R, Chansi BS, Shah K, Munday D et al. A staff support programme for rural hospitals in Nepal. Bull World Health Organ. 2016;94(1):65-70.
Responsiveness												
1	Nurses, dentists, physiotherapists, social workers, occupational therapists, pharmacists, psychologists, dietitians, podiatrists and other allied health workers, Australia	Descriptive demographic and professional data analysis	Diverse sample group, short timeline - 1 year	None identified	No separation between rural and remote	None identified	None identified	Moderate to low	349 recruits	No	Financial factors were the number one reason for participating in the Rural Health Professionals Program (RHPP) but professional and location factors were also important. Government-funded recruitment programmes can attract and recruit health workers to rural and remote practice settings. There is a gap in the literature addressing the effectiveness of interventions specifically designed to improve recruitment and distribution of nursing and allied health professionals.	Morell AL, Kiem S, Millsteed MA, Pollice A. Attraction, recruitment and distribution of health professionals in rural and remote Australia: early results of the Rural Health Professionals Program. Hum Resour Health. 2014;12:15.
Unintended effects												
1	Community-based volunteers, Ghana	Structured surveys administered face to face, followed by select, in-depth interviews and focus group discussion to collect data on reasons for volunteering	Retrospective. Face-to-face surveys may increase tendency for volunteers to endorse altruistic responses.	None identified	None identified	Serious, small number and most p values insignificant	None identified	Very low	205	No	Receiving a per diem for travel accommodation and food costs was negatively associated with satisfaction with the role, but an extra duty allowance had a weak positive association with satisfaction. Overall volunteers reported high satisfaction, with themes of valuable training, preferential treatment by the health service, social recognition and helping the community. A sense of unfairness compared with other volunteers' incentives was mentioned by some as a reason to stop volunteering. 55% were dissatisfied with non-monetary incentives.	Afari-Asiedu S, Asante KP, Senah K, Abdulai MA, Afranie S, Mahama E, et al. Volunteering for health services in the middle part of Ghana: in whose interest? IJHPM. 2018;7(9):836-46.

E4. Bundled initiatives/integrated evidence A, C and D

Quality assessment									Summary of findings			
No. of studies	**Health worker occupation(s)**	**Design**	**Limitations**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Quality of evidence**	**No. of participants/sample size**	**Was there a control group?**	**Reported effects/outcomes**	**Reference**
Availability (measured as retention, proportion of health workers recruited to rural areas)												
1	Human resources for health, Cambodia, China, Viet Nam	Key informant interviews in 3 countries	No data on recruitment and retention	Significant	Significant	Significant	Useful context of whole health system to consider when attempting to recruit and retain staff	Very low	28 interviews	No	Qualitative impression - the local health system and impacts the recruitment and retention of health workers.	Zhu A, Tang S, Thu NTH, Supheap L, Liu X. Analysis of strategies to attract and retain rural health workers in Cambodia, China, and Vietnam and context influencing their outcomes. Hum Resour Health. 2019;17(1):2.
Competence												
None												
Responsiveness												
None												
Unintended effects												
1	Intern doctors, India	Qualitative, cross-sectional. Focus group, assessing impact of introduction of rural medical internships and factors important to recruitment and retention	Small study	None identified	None identified	None identified	None identified	Very low	38	No	An unsatisfactory rural medical internship reduces the intention to work rurally.	Dasman H, Mwanri L, Martini A. Indonesian rural medical internship: the impact on health service and the future workforce. Indian J Public Health Res Dev. 2018;9(7):231-6.

E5. Bundled initiatives/integrated evidence B and C

Quality assessment									Summary of findings			
No. of studies	**Health worker occupation(s)**	**Design**	**Limitations**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other considerations**	**Quality of evidence**	**No. of participants/sample size**	**Was there a control group?**	**Reported effects/outcomes**	**Reference**
Availability (measured as retention, proportion of health workers recruited to rural areas)												

1	GPs, France	Mixed methods, longitudinal study GP density in a specified rural setting "rural living area". Multi-professional group practices with financial incentives, cost sharing and incentive packages.	Primary care teams (PCT) were mainly located in underserved areas	Not suspected	Not suspected	Not suspected	Similiar to this study but with longer timeframe: Chevillard G, Mousques J, Lucas-Gabrielli V, Bourgueil Y, Rican S et al. Mesure de l'impact d'une politique publique visant à favoriser l'installation et le main- tien de médecins généralistes : l'exemple du soutien au développement des maisons et pôles de santé en France. Revue d'Économie Régionale et Urbaine. 2015;657-94.	Moderate	The analysis sample is composed of 1416 rural "living areas": 1232 control and 184 cases	Yes	Rural areas with PCTs experienced a slowdown in loss of GPs. Areas with PCTs, compared with similar areas without PCTs, are experiencing a more favourable evolution of GP density in deprived rural areas with an average difference-in-differences of 3.5 GPs per 100 000 inhabitants. This finding suggests that multi-professional group practices help to attract and retain GPs, probably through the improvement of working conditions - with a "slowdown in loss of GPs".	Chevillard G, Mousques J, Lucas-Gabrielli V, Rican S. Has the diffusion of primary care teams in France improved attraction and retention of general practitioners in rural areas? Health Policy. 2019;123(5):508-15.
Competence												
None												
Responsiveness												
None												
Unintended effects												
None												

E6. Bundled initiatives/integrated evidence A and D

Quality assessment									**Summary of findings**			**Reference**
No. of studies	**Health worker occupation(s)**	**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 factors that would make a health worker choose a certain job post)												
1	Medical graduates, United States of America	Case study from online surveys	None identified	None identified	None identified	None identified	None identified	Low	26	No	Wisconsin Rural Physician Residency Assistance Program (WRPRAP). Influence by significant others, meaningful work, integration into local community were the most important factors revealed for remaining in a rural location.	Morken C, Bruksch-Meck K, Crouse B, Traxler K. Factors influencing rural physician retention following completion of a rural training track family medicine residency program. WMJ. 2018;117(5):208-210.
Competence												
None												
Responsiveness												
None												
Unintended effects												
None												

E7. Bundled initiatives/integrated evidence C and D

Quality assessment									**Summary of findings**			**Reference**
No. of studies	**Health worker occupation(s)**	**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, proportion of health workers recruited to rural areas)												
1	TB health workers, Cambodia	Data from in-depth interviews, meetings, workshops and observational study	Occupational sampling and sampling size	None identified	None identified	None identified	Conflict of interest in health worker activities and pay	Very low	10	No	Rural health workforce retention was influenced by institutional factors relating to the structure of the health system, capacity building and staffing issues, competition from the private health sector, and medical supplies. Personal factors proved central to individual health workers' decision-making about working in rural areas. These included work responsibilities, motivation and issues around financial needs; stayed a long time because of personal rewards, yet job performance was hindered by institutional factors. Undermining systems working in parallel (public and private).	Chhea C, Warren N, Manderson L. Health worker effectiveness and retention in rural Cambodia. Rural Remote Health. 2010;10(3):1391.
1	Doctors, physician assistants and allied health workers, United States of America	Review of programme over years of development	Small sample	None identified	None identified	None identified	None identified	Low	Small	No	Partnership between university and local foundation improved recruitment and retention of 10 health professionals (5 GPs) over 3 years. Improved perception of clinical training rotations, increased access to consultations via telemedicine and reduced teenage pregnancies.	Reid R, Rising E, Kaufman A, Bassett A, McGrew MC, Silverblatt H et al. The influence of a place-based foundation and a public university in growing a rural health workforce. J Community Health. 2019;44(2):292-296.
Competence												
None												
Responsiveness												
None												
Unintended effects												
None												

E8. Bundled initiatives/integrated evidence D

Quality assessment	**Summary of findings**

No. of studies	Health worker occupation(s)	Design	Limitations	Inconsistency	Indirectness	Imprecision	Other considerations	Quality of evidence	No. of participants/sample size	Was there a control group?	Reported effects/outcomes	Reference
Availability (measured as factors that would make a health worker choose a certain job post)												
1	Rural GPs, Canada	Cross sectional qualitative semi-structured interviews	Some limitations	None identified	None identified	None identified	None identified	Low	42	No	Early career doctors have different ideas about ideal workplace conditions compared with later career doctors and this may influence recruitment and retention. Practices that adapted to these generational differences reported better recruitment and retention.	Snadden D, Kunzli MA. Working hard but working differently: a qualitative study of the impact of generational change on rural health care. CMAJ Open. 2017;5(3):e710-e716.
Competence												
None												
Responsiveness												
None												
Unintended effects												
None												

Supporting evidence

Brown L, Williams L, Capra S. Going rural but not staying long: recruitment and retention issues for the rural dietetic workforce in Australia. Nutr Diet. 2010;67(4):294-302.
Goel S, Angeli F, Bhatnagar N, Singla N, Grover M, Maarse H. Retaining health workforce in rural and underserved areas of India: what works and what doesn't? A critical interpretative synthesis. Natl Med J India. 2016;29(4):212-218.
Marchand C, Peckham S. Addressing the crisis of GP recruitment and retention: a systematic review. Br J Gen Pract. 2017;67(657):e227-e237.
Nagai M, Fujita N, Diouf IS, Salla M. Retention of qualified healthcare workers in rural Senegal: lessons learned from a qualitative study. Rural Remote Health. 2017;17(3):4149.
Safi N, Naeem A, Khalil M, Anwari P, Gedik G. Addressing health workforce shortages and maldistribution in Afghanistan. East Mediterr Health J. 2018;24(9):951-958.
Sripathy A, Marti J, Patel H, Sheikh JI, Darzi AW. Health professional education and universal health coverage: a summary of challenges and selected case studies. Health Aff. (Millwood). 2017;36(11):1928-1936.
Vong S, Raven J, Newlands D. Internal contracting of health services in Cambodia: drivers for change and lessons learned after a decade of external contracting. BMC Health Serv Res. 2018;18(1):375.
Mashange W, Martineau T, Chandiwana P, Chirwa Y, Pepukai VM, Munyati S, et al. Flexibility of deployment: challenges and policy options for retaining health workers during crisis in Zimbabwe. Hum Resour Health. 2019;17(1):39.
van de Pas R, Kolie D, Delamou A, Van Damme W. Health workforce development and retention in Guinea: a policy analysis post-Ebola. Hum Resour Health. 2019;17:63.
Sturesson L, Öhlander M, Nilsson G, Stenfors T. Migrant physicians' conceptions of working in rural and remote areas in Sweden: a qualitative study. PLoS ONE. 2019;14(1) e0210598.
Buykx P et al, Australia Systematic review of effective retention incentives for health workers in rural and remote areas: Towards evidence-based policy Aust. J. Rural Health (2010) 18, 102–109
Danish A, Blais R, Champagne F. Strategic analysis of interventions to reduce physician shortages in rural regions. Rural and Remote Health 2019; 19: 5466.
Liu X et al. Analysis of context factors in compulsory and incentive strategies for improving attraction and retention of health workers in rural and remote areas: a systematic review. Human Resources for Health (2015) 13:61
Mbemba et al Interventions for supporting nurse retention in rural and remote areas: an umbrella review. Human Resources for Health 2013, 11:44
Padre P et al. More Doctors Under The Gaze Program of users: an evaluative survey. Physis: Revista de Saúde Coletiva, Rio de Janeiro, v. 29(2)
Parlier A. et al. The Road to Rural Primary Care: A Narrative Review of Factors That Help Develop, Recruit, and Retain Rural Primary Care Physicians. Acad Med, Vol. 93, No. 1
Russell D et al. Determinants of rural Australian primary health care worker retention: A synthesis of key evidence and implications for policymaking. Aust. J. Rural Health (2017) 25, 5–14 Retention factors.
Smith S et al. Nurses' experiences of working in rural hospitals: An integrative review, factors & recommendations. JNurs Manag. 2019;27:482–490

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