

7-Step Checklist for Implementing Rural Pipelines- DRAFT

Action	Questions	A summary of the evidence in low and middle income countries
<p>Step 1 Environmental scan of rural policies and community needs</p>	<p>Are there important rural health policies/plans to draw on? What are rural community healthcare needs?</p> <ul style="list-style-type: none"> Of these, what is feasible to address now and will help develop a service base for the community, from which we can build further? What rural healthcare teams, working at what scope, would help address this community need? 	<p>A scan of the national policies and plans for rural health and also exploring rural community needs for healthcare helps to work out priorities for action. These may need to be sorted into an order, particularly in the face of competing demands for resources and in some cases, extensive unmet need. A quick scan of current rural workers' clinical caseload and practice patterns can inform local workforce gaps.</p> <ul style="list-style-type: none"> WHO recommendations about task—shifting aim to support countries to scale up workforce quality, with regulation, certification and registration.(1) WHO Global Policy Recommendations about increasing access to health workers in remote and rural areas provide 5 clear recommendations about scalable education policies, which countries could adopt and tailor for national policy and planning for developing the rural workforce.(2) WHO Global Strategy on human resources for health: Workforce 2030 denote the need for countries to have human resource units responsible for rural workforce planning and improving the quality and access to rural workforce.(3) There are other examples of low and middle income countries (LMIC) adopting national policies such as the Mais Medicos (MM) “more doctors” by the Ministry of Health of Brazil 2013 which aimed to train more doctors, implement rural curricular and invest in rural health infrastructure.(4) Iran introduced a policy for national Community Health Workers (CHW) training in 1979. (5) Further, the Thai government have over four decades' of policies to support rural workforce and in 1994 implemented the Collaborative Project to Increase Rural Doctors (CPIRD to select, train and retain rural doctors.(6) China also has several examples of national educational planning for rural workers with specific goals and targets (7). In terms of rural community needs, Cho et al 2018 (Vietnam) outlined a rapid participatory appraisal (RPA) which was coupled with community engagement to identify community need and training issues for seven rural provinces leading to prioritising investment in chronic disease services and training. (8) Other countries reviewed needs by exploring rural health worker skills and scope. Salehi Zalani 2016 (Iran) reporting a review of the factors affecting performance of Community Health Workers (CHW) in Iran's villages and identified CHW cannot face the current and emerging needs of rural communities and more cadres of complimentary workers is needed, and more training is needed to enable rural workers to handle the scope of work.(9) Shelley et al 2016 (Zambia) identified that although Community Health Assistants (CHA) were trained to support rural health posts, including mainly community work (80%), when deployed, demand at the clinic meant their work was focused there, they needed more supervision, limited by work pressures of supervisors. A clinic-orientated curriculum, more critical mass and infrastructure were identified as potential enablers. (10) Couper et al 2018 (Africa and South Africa) from a survey of 421 District Hospital Managers and 975 Mid-Level Workers in four countries identified that their training prepared them for around 50% of the conditions they saw.(11)
<p>Step 2 Existing workers and their scope</p>	<p>Do workers already exist with skills for this scope of work, easily recruited/retained?</p> <ul style="list-style-type: none"> What are their qualifications and training relative to the skills demands of the role? Limited – Steps 3+ Are they motivated to work at the required scope? No – Steps 3+ Is their health service supporting their increased scope? No- Steps 3+ Are they being retained in rural and remote areas? No - Step 3+ Are they attracted to work in rural and remote communities? No - Steps 3+ Are there local champions who support them? No – Steps 3+ 	<p>The skill levels of rural workers may not be sufficient to meet rural and remote community needs. A scan of existing rural and remote health workers and their skills, practices and motivations can inform rural pipeline strategies. Rural and remote healthcare teams having a wider range of skills, supported by organisations to address community need, can improve comprehensive local care and potentially help to improve health worker satisfaction and retention.</p> <ul style="list-style-type: none"> Li et al 2013 (China) described a national survey of rural doctors identifying that nearly two-thirds had a high school diploma and around half had received less than 12 days training, they wanted to extend training time and get on-the-job skills learning.(7) Sánchez Del Hierro 2014 (Ecuador) described the gap in skills of university medical graduates (trained in cities) and use of obstetrics skills in their compulsory rural service year. They showed several skills important in rural intern practice but often had not been experienced as an undergraduate.(12) Abera et al 2014 (Ethiopia) outlined that only 31% of rural Primary Health Care Workers delivering mental health services had had a clinical attachment in mental health during training; 91% said they had some pre-service training in mental health, but they had had no further in-service training since starting work. A higher proportion of the degree qualified nurses were willing to deliver mental health services.(13)

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		<ul style="list-style-type: none"> Allen et al 2006 (Nepal) outlined training provided to rural junior doctors, hospital and community nurses for newborn care which increased knowledge but the service's limited perception of the need in the community could inhibit practice of skills.(14) Luo et al 2018 (Ghana) described the effect of Ghana district hospitals recruiting specialist medical obstetrician-gynaecologists in last three years to complement maternity services improved comprehensive local care and supported midwives in managing complex pregnancies.(15)
Step 3 Selection	<p>How can we select workers for this role from the community?</p> <ul style="list-style-type: none"> Are there existing or new cadres which could fill these roles given targeted short course or university training? What process and criteria will effectively select them from the community for the community? What is the entry level standard appropriate for coping with the training? What financial and social support do community members need to access training? What are the cost-benefits of training a new worker? 	<p>An extensive range of community selection options are demonstrated involving selecting people with connection to “place”, commitment to serve others, motivated to learn and invested in improving access to community health services.</p> <p>Universities and training courses with a “social accountability” for developing health workers trained and ready to work where they are most needed, tend to select students committed to helping underserved. Selection of rural background, underprivileged people of different race and language groups relative to the country and rural context is important, along with financial and social support for these groups to fully participate in city courses. Cost benefits of developing new workers are important considerations and should be evaluated.</p> <ul style="list-style-type: none"> Newman et al 2010 (Peru) identified that of General Practitioner doctors working in a poor region, 40% were interested in pursuing a specialty needed in the region, but the main barrier was cost and relocation required for accessing the training, local training pathways were needed.(16) Husum et al 2003 (Cambodia and Iraq) described selecting for intensive trauma training from community members of mine-infested areas, with hands-on experience, trusted by local community, with high moral standing, literate, and with basic maths skills.(17) Siega-Sur et al 2017 (Philippines) describes the health students are selected based on “commitment to serve” not academic record.(18) Tani et al 2016 (Tanzania) described selecting Community Health Workers through schooling and academic standard as well as application sent to village executive officer, screened by village committee and brief of candidate to community members. (19) Phiri et al 2017 (Zambia) describes Community Health Assistants selected from health posts in the communities where they will serve.(20) Morgan et al 2018 (Ethiopia) described selecting doctors wanting to practice socially accountable medicine and from lower income families. (21) Van Heng et al 2008 (Cambodia) describe selecting rural surgical care providers for trauma training among those working in surgical care in the rural hospitals, selected by community as having good medical skills, high moral standing, at least five years' practical experience and living and working permanently in their rural hospital and sign contracts to stay after the program.(22) Knettel et al 2017 (Haiti) described local 'federations' or grassroots community organisations selecting community workers (volunteer) as identified as having had some health training or leadership skills.(23) Shelley et al 2016 (Zambia) described Community Health Assistants (CHA) as females with experience as volunteers in the community, selected by district staff and interviewed.(10) Zimmerman et al 2016 (Nepal) selected rural/remote Family Physician registrars by negotiating with universities for pre-selection of Family Physician seats in rural hospitals, advertising (an attractive post-graduate training package), recruiting rural background applicants academically tested for competitive selection.(24) Halili et al 2017 (Philippines) described a regionalised medical school with social mission and selecting people socially accountable and from lower income families.(25) Tumbo et al 2009 (South Africa) identified that of 7,358 medical, Physiotherapist, Occupational therapist and Dentists training in 9 faculties in South African Universities, 4,341 (59%) were from cities, 1,107 (26%) from rural areas, differing by course - medicine 27.4%, physiotherapy 22.4%, occupational therapy 26.7% and dentistry 24.8%. A higher rural selection would be needed for parity with rural population (46%).(26)

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		<ul style="list-style-type: none"> Hamm et al 2016 reviewed the costing of the development of new mid-level healthcare workers (Clinical Associates - CAs) in South Africa. Full training cost to the province was R 300 850 and average employment cost per year is R196 329. For medical practitioners these costs are R 730 985 and R 559 397, respectively. CAs have potential to free up the time of a medical practitioner by 50–76%, provide the same quality of care given adequate training, support and supervision and be more willing to work in rural areas compared to medical practitioners.(27) Husum et al 2003 (Cambodia and Iraq) described that one trained “mine medic” trained through a Village University model, cost US\$300 in training expenses and \$800 in equipment and US \$26 per case of trauma treated.(17) Leon et al 2010 (Tanzania) identified in a survey of final year medical students that a limited proportion have rural background - 20% females and 36% males compared with the proportional rural population.(28) Pei et al 2018 (China) identified that Interest in rural work by students studying medicine through selective admission of rural students was not strong (25% agree, strongly agree “I am willing to work in rural areas as a medical worker”) whereas extrinsic motivations were strong (socioeconomic and cultural motivators) and they suggested the student’s humanistic qualities may be more important for producing doctors to serve rural populations. (29)
Step 4 Education and training	<p>How can we effectively educate, train and up-skill people <i>in rural areas and for breadth of skills</i> needed by rural communities?</p> <ul style="list-style-type: none"> What bridging courses are required? What rural curriculum is relevant/ who can help to develop and validate this? How can theoretical and practical components be delivered <i>in rural areas</i>? How much real-time supervision and virtual supervision will work to learn practical skills safely? How can the practicum be designed to support the scope and complexity of skills required? What further training can the qualification articulate with for career development (short course or university)? How much would it cost to train/employ/support students and how can this be funded? 	<p>Optimal education and training for rural practice occurs through exposure to rural and remote practice, teams and health systems. Learning the range of skills needed is effective through distributed training systems using locally-available qualified teachers and supervisors, in the place where people are going to practice and the people the workers are going to help after they finish training. This often occurs within university and other training organisations with a “social accountability” for developing health workers trained and ready to work where they are most needed.</p> <p>For optimal effect, more practical training in the rural communities is best, along with bundled support to optimise the educational experience. Compulsory service strategies work best if they are combined with selection, education and support strategies. Education and training needs to include options for step-ladder progression.</p> <ul style="list-style-type: none"> Budhathoki et al 2017 described in a systematic review of medical student’s intentions to work in rural areas of LMIC found rural background, training in rural with community based curriculum and early exposure to rural training in medical school motivated students to work in rural areas.(30) Crompton et al 2013 in a systematic review about the strengths and weaknesses for medical students and supervisors of community placements in underserved areas described the placements have benefits of expanding clinical knowledge, confidence, inter-personal skills and increase likelihood of returning.(31) Farmer et al 2015 described from a scoping review of rural medical education that rural training of a variety of forms increases uptake of rural work by graduate doctors. (32) Wilson et al 2009 described a comprehensive review of rural worker retention, finding that evidence supported implementation of well-defined selection and education policies, with incentives, with less evidence of long-term effect from coercive strategies.(33) Verma et al 2016 described a literature review to evaluate interventions used to recruit and retain primary care doctors internationally and found weak evidence supporting rural under and postgraduate placements, recruiting rural background students and mixed evidence that financial incentives work.(34) Halili et al 2017 (Philippines) shows better return to rural and more generalist practice in early career doctors who trained in a rural region with socially accountable curriculum.(25) Couper et al 2005 (South Africa) showed that outreach expert skills trainers can provide on-site rapid up-skilling courses for existing rural doctors and nurses to extend scope in neonatal resuscitation using train the trainer models, but the provider needs support, lessons between regions shared, equipment needs to be sufficient for ongoing practice in rural areas. Sustaining training challenging with limited funding.(35) Siega-Sur et al 2017 (Philippines) describes the step ladder curriculum so many move from community to certificate in Community Health Work (midwifery) to Bachelor of nursing (BSN) to Doctor of Medicine. In the course of this process students gain exposure to community practice at multiple levels (more than 50% student learning is ‘service learning’) including as doctors 18 months in community clerkships, fostered by families in the community. (18)

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		<ul style="list-style-type: none"> • Tilahun D et al 2017 Ethiopia described training Health Extension Workers for extended scope via a 2 week course. All HEW reported high level need for training for their grassroots role but training materials need to be well understood and ongoing training is needed.(36) • Mung'omba B and Botha ADH 2017 (South Africa) described the need for rural training to incorporate core and additional skills that rural radiographers can tailor the environment where they work. There is limited rural-relevant curriculum currently.(37) • Hu et al 2016 (China) identified that decentralising a degree-linked Continuing Medical Education (CME) program for rural workers (junior college trained and 65% <25 years old) to upgrade their qualification was perceived to be most likely to work by those seeking Bachelor degree qualifications and who considered that they could pass exams. (38) • Husum et al 2003 (Cambodia and Iraq) demonstrated a decentralised "Village University" model for new cadres of workers to manage "landmines" trauma, which included practical work between periods of training and by developing 44 Village University student graduates and by train the trainer- 2800 layman health responders were trained.(17) • Van Heng et al 2008 (Cambodia) using the same training model, showed 21 trauma surgery care providers could be trained in place over four years, to improve quality of surgical outcomes and provider confidence.(22) • Yi et al 2015 (Thailand) found that rural track medical students have strong pass results on the clinical component of national licensure exams but their outcomes may not be as strong at the same assessment point, on basic sciences.(39) • Reid et al 2011 (South Africa) identified that rural doctors were at earlier career stages than metropolitan counterparts, more likely to have had rural undergraduate training and less likely to be motivated by career, family and financial issues. Race also predicted rural work.(40) • Kibore et al 2014 (Kenya) started 7 week placements in rural hospitals for fourth year medical students learning in groups of 3 per consultant with interactive group learning via weekly webcast which led to good hands on experience for students (2/3 were from the city), and supervisors.(41) • Kizito et al 2017 (Uganda) described compulsory rural community exposure for university health undergraduates via a Community-Based Education and Research (COBERS) of 5-8 weeks under a medical tutor, with 2x weekly tutorials. Prior to COBERS student interest in rural work was mainly about the allowance and social amenities available but after COBERS, factors were access to long distance courses (OR 2.0) and being posted to facility in rural area (OR 15.0).(42) • Bhushan et al 2015 (India) described a program to deliver systems and 16 weeks of training for non-specialist doctors (NSD) to extend scope of obstetrics work in rural areas resulted in 4 nodal master training centres, 34 tertiary training centres, and 221 master trainers. 1500 NSD completed the course. Agreement of specialist colleges was enabling, and sufficient pool of trainers were needed for trainer turnover. (43) • Techakehakij et al 2017 (Thailand) described outcomes of Collaborative Project to Increase Production of Rural Doctors (CPIRD), involving rural selection and 3 years rural clinical training of medical students near hometown and posting back to home community for 3 years with financial penalty for non-compliance. CPIRD graduates had higher rural retention compared with normal track peers, and lower annual resignation. (44) • Yi et al 2015 (Thailand) further described CPIRD track students had stronger Grade Point Averages on License Exam than normal track. (39) • Putthasri et al 2013 (Thailand) identified that CPIRD rurally selected and trained medical students posted back to home community for three years' mandatory service (breaking contract cost around \$13,000) had higher odds of intention to complete the mandatory service period than normal track peers with the same mandatory rural return of service arrangements.(45) • Pagaiya et al 2015 (Thailand) identified that CPIRD rurally selected and trained medical students posted back to home community were better rurally retained than normal track students but attrition occurred after the first year, for city-based specialty training positions.(6)

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		<ul style="list-style-type: none"> Zimmerman et al 2016 (Nepal) described a rich post-graduate training program for family physicians with bundled professional and personal support (supported by senior fellowed doctors). It included whole of hospital in-service support, capacity building with hospital management, accommodation and financial support for children's education, three-fold comparative financial remuneration, position descriptions for graduates and performance incentives. The result was a continuous supply of trainees, on compulsory service scholarships and significantly more caseload and obstetric cases in rural/remote hospitals.(24) Henderson et al 2008 described an in-depth synthesis of published and grey literature about incentives for retraining health workers In the Asia-Pacific region. Salaries and benefits, together with working conditions, supervision and management, and education and training opportunities are important and need to be tailored to country and region.(46) Theron et al 2000 (South Africa) demonstrated a low cost printed manual and 9 skills workshops for adult self-learning improved knowledge for midwives about caring for mothers and infants in rural areas compared with controls. (47) Da Silva et al 2018 (Brazil) described the Mais Medicos program implemented in national law in 2013, which targeted more medical services for rural underserved areas through more enrolments, new curricular guidelines for primary, urgent and emergency care, investment in infrastructure and supplying doctors to vulnerable municipalities, but the higher salaries in poorer areas did not attract physicians to commit to one area, but many foreign doctors were used to supply the program, some of which had communication barriers with local people (32%).(4)
Step 5 Environmental scan of working conditions (things which impact recruitment and retention)	What are the practice conditions in the community which could affect satisfaction, recruitment and retention? <ul style="list-style-type: none"> Orientation to the workplace Senior workers to supervise/support and enable learning on the job Health service management strong Housing and meals Transport e.g. bicycles Medical supplies Security for workers Remuneration for employees On-call roster/ time off Subsidies for work away from home 	<p>Education and training is only likely to be effective in recruiting and retaining health workers if the practice conditions are right, there is a supportive learning culture in the health service, there are supplies, good remuneration, and sustainable workload.</p> <ul style="list-style-type: none"> Kaye et al 2011 described a review of material about the scope and nature of community-based education (CBE) for various Uganda health worker cadres. Although CBE is common, implementing institutions cited human resource, financial, and material constraints. This study found that many training institutions reported difficulties with finding sufficient well run PHC facilities in rural Uganda that can serve as effective training centres.(48) Kok et al 2015 identified from a systematic review about interventions to increase performance of Community Health Workers (CHW) that a mix of financial and non-financial incentives, predictable for the CHWs, was found to be an effective strategy to enhance performance, especially of those CHWs with multiple tasks. Non-paid tasks are de-motivating. Supervision is important but few studies identified optimal supervision models.(49) Zimmerman et al 2016 (Nepal) described that physicians doing 3-year training in remote Nepalese hospitals with obstetric skills received salaries 3 times higher than the usual government rate, (not including other government benefits) as part of a comprehensive bundled support package but some barriers persisted including perceptions hospital management was dysfunctional.(24) Moran et al 2013 reported on an integrative review as to support interventions for health-care practitioners in rural and remote contexts found that outcomes were affected by cost considerations and organisational support.(50) Bladcock et al 2016 described from a review of randomised controlled trials of health worker performance in Sub-Saharan Africa that health worker performance is strongly related to the environment and context in which they work.(51) Budhathoki et al 2017 described in a systematic review of medical student's future intentions to work in rural areas in LMIC that barriers were perceived lack of infrastructure, high workload, poor hospital management and isolation.(30) Van Dormal et al 2008 (Mali) described a successful professional orientation/support and education top up program for newly recruited rural doctors in Mali which improved short-term retention and built strong ties to experienced senior clinicians who could contribute to problem-solving and identity building. Training and professional support at the time of uptake of rural work may be important.(52) Vyas et al 2014 described a blended distance/ face to face education support program for junior doctors working in rural hospitals in India (on a rural service obligation). The face to face component provided regular contact for the 15 modules of online learning to help the doctors' work effectively in rural areas as their first year rural practice.(53)

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		<ul style="list-style-type: none"> • Rennert et al 2009 (Honduras) described one week of training for Community Health Workers selected from the community to provide extended scope of child health services and given basic medical supplies which improved activity but sustainability of the intervention could be affected by poor medical supplies and worker isolation.(54) • Wangmo et al 2016 (Myanmar) described Auxiliary Midwives (AMW) in practice showing they provided valuable maternal and child health services but 90% expressed receiving no adequate supervision, 42% had no refresher training in 2012 and 99% said they needed a refresher course, there was not sufficient replenishment of AMW medical kits and transport costs for them to work at full scope.(55) • Ludwick et al 2018 (Uganda) identified that strong supervision involving supervisors involved directly in problem solving, leading, being available to Community Health Workers is not easy to achieve in a standardised way but important for human resource development beyond one off training events. (56) • Ndima et al 2015 (Mozambique) suggested from a study of supervision of Community Health Workers, that supervisors need more training, professional recognition and protected time for supervision to occur in a more systematic way.(57) • Cavendar et al 1998 (Ecuador) described physicians doing a rural compulsory term (pre-certification) found it both professionally and personally rewarding, but it was not well linked with its goal of increasing rural workforce as there was limited support. Of the 127 respondents, 59% (n = 75) reported that no orientation program was provided prior to their placement (pre-rural component) and they went to rural communities with limited knowledge of rural communities and with few material to solve simple problems. Main issues were transportation, communication, housing, food, access to potable water and electrical power.(58) • Liu et al 2018 (China) identified that of medical students commencing a rural return of service obligation (6 years) via a selected entry fee-waived program, that satisfaction with enrolment procedure, employment contract, the education component and living allowance were related to intention to break the contract and leave after the contract expires.(59)
Step 6 Accreditation and Recognition	How can people who are trained for rural work be accredited and recognised? <ul style="list-style-type: none"> • What qualification can they be given? • How can the community value graduates of the training? • Is there a professional title for graduates? • Are the graduates recognised at country level for what they do? • Can the graduates be paid appropriately for using the skills they have developed? 	<p>Accreditation and recognition is important for the worker for their training and scope of work. It helps reinforce their investment in doing more training and supports their retention in the role and use of all their skills. Clear accreditation and recognition also helps the community to identify different cadres.</p> <ul style="list-style-type: none"> • Mung'omba B and Botha ADH 2017 (South Africa) described scoping out the competencies needed in rural radiography scope of practice and that national recognition would be an enabler of improving the rural-curriculum/training for rural radiography workforce.(37) • Singh et al 2015 used a literature review to define typologies of Community Health Workers (CHW) in LMIC and the effect of payment for employment. Both volunteer and remunerated CHWs are potentially effective and can bring something to the health arena that the other may not but training and payment is important for CHW recognition and holistic and sustained service provision.(60) • Kawasaki et al 2015 (Brazil) described Community Health Worker ((CHW) refresher training, emergency skills training through participatory skills sessions led by nurses and doctors once a month which helped to build their reputation and recognition by the community (based on a survey), but even though they were recognised, their roles were bound by the intensity of community need for basic services like providing medicines.(61) • Zimmerman et al 2016 (Nepal) described that position descriptions for Family Physicians training and working in remote Nepalese hospitals with obstetric skills was undertaken to improve hospital and community recognition of the doctors and their skills.(24) • Rabbani et al 2016 (Pakistan) described a motivating factor for Lady Health Supervisors was being trained for supervision and recognised and praised for the quality of supervision they provided, as well as having autonomy and personal support for their role.(62) • Mboineki et al 2018 (Tanzania) described rationale for new Advanced Nurse Practitioners to formally substitute lack of medical doctors in rural primary care facilities but recognition and political support of the role would be needed, along with appropriate training and supportive practice infrastructure.(63) • Tshering et al 2018 in a review of literature (19 studies included) from 11 developing countries identified retention of Village Health Workers (VHW) were largely related to individual community, professional and reward systems.(64)

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<p>Step 7 Professional support and up-skilling</p>	<p>How can rural workers be professionally supported?</p> <ul style="list-style-type: none"> • What systems are there for getting feedback on challenging cases? • What refresher courses are available particularly for low volume, important skills? • Can the worker connect with other workers of this cadre for professional meetings and practice discussions? 	<p>Online communities of practice and peer exchange systems can be useful but they need to be tailored to the health workers' needs, organised and evaluation. If senior staff are not onsite, then at least monthly remote or in-out reach connections for face to face meetings and case reviews by senior staff should be facilitated. Structured orientation and community-based projects for new staff can improve transition to rural work as a new worker and interest in continuing in the role.</p> <ul style="list-style-type: none"> • Barnett et al 2012 described from a literature review that primary care practitioners (General Practitioners) can be supported by virtual communities of practice (online) to complement face to face support but online support models needed facilitation, depend on infrastructure and organisational leadership and require better outcomes evaluation.(65) • Van Wieren et al 2014 (Mexico) described a support program to help junior doctors in their mandatory rural hospital year to access supportive on site mentorship at work commencement, supervision (from experienced clinicians), and get clinical information resources and monthly interactive seminars to support their clinical caseload. The experience was positive and rural career plans were fostered but perceptions by doctors of being less well prepared for residency entrance exam needed to be addressed.(66) • Curran et al 2010 described from a review and synthesis of continuing professional development for doctors that the professional development and up-skilling needs of rural doctors are unique and highlighted the need for a tailored framework including rural outreach-support models in LMIC. (67) • Moran et al 2014 reported on an integrative review as to support interventions for health-care practitioners in rural and remote contexts. They found access to appropriate and adequate training, skills were important but there was limited literature evaluating support, supervision and mentoring interventions.(50) • Mbemba et al 2013 did an umbrella review (overview of systematic reviews) of interventions for supporting nurse retention in rural and remote areas. Two reviews showed that financial-incentive programs improve rural work. Three other reviews highlighted supportive workplace factors like relationships and information and communication technologies along with rural health career pathways were related to rural retention.(68) • Hoque et al 2014 identified that after field training, monthly supervision of different cadres of health workers delivered better skills for workers delivering a range of child health measures regardless of pre-service training levels (18 months versus 4 years) than standard supervision in control facilities.(69) • Saab et al 2003 (Lebanon) identified that a structured remote outreach Continuing Medical Education program, with remote GP presenters involved, can be a good way to engage remote doctors and value their work.(70) • Ajeani et al 2017 (Uganda) demonstrated development of mentorship for frontline health workers in rural areas using the cascade model to train mentors, who then mentor locally, which was important for backing up confidence in the skills learnt in training for maternal and newborn care. (71) • Butterworth et al 2014 (Nepal) described weekly mentoring coupled with Continuing Medical Education 4 module (CME) intervention for junior doctors and GPs mainly in rural areas helped with CME completion and mentored participants were more reflective about their learning.(72) • Li et al 2015 (China) identified through a survey of rural physicians that lifelong learning orientation is related to early career, more trained rural doctors who are satisfied with career to inform how to promote uptake of continuing professional development among different target groups.(73) • Nqala et al 2015 (South Africa) explored a small scale real time in-reach telephone support for anaesthetics support for early career rural doctors which was not structured enough to get the right advice at the right time from the right urban support person.(74) • Chib et al (2013) identified that village doctors using online communication systems could help with time efficiency, access to medical information, particularly in mobile phone and online social network usage and help to develop relationships at proximate, distant, and virtual levels.(75) • Vyas et al 2011 (India) described a program for junior doctors undertaking a compulsory 2 year mandatory placement in small rural hospitals whereby their base University worked with them to support them to do a local research project. The project helped them to engage with local health issues, learn research and interact with staff and communities to problem solve. Interim results identified good effects for enhancing student learning and positive outcomes of rural hospital work experience.(76)

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7-Step Checklist for Implementing Rural Pipelines- DRAFT

References

1. World Health Organization. Task shifting : rational redistribution of tasks among health workforce teams : global recommendations and guidelines. Geneva: WHO; 2008. p. 1-96.
2. Increasing access to health workers in remote and rural areas through improved retention: Global Policy Recommendations. 2010.
3. World Health Organization. Global strategy on human resources for health: workforce 2030. Geneva 2016. p. 1-64.
4. da Silva EN, Ramos MC, Santos W, Rasella D, Oliveira A, Pacheco Santos LM. Cost of providing doctors in remote and vulnerable areas: Programa Mais Medicos in Brazil. 2018.
5. Javanparast S, Baum F, Labonte R, Sanders D, Rajabi Z, Heidari G. The experience of community health workers training in Iran: a qualitative study. *BMC Health Services Research*. 2012;12:291-.
6. 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. *Human Resources For Health*. 2015;13:10-.
7. Li X, Liu J, Huang J, Qian Y, Che L. An analysis of the current educational status and future training needs of China's rural doctors in 2011. *Postgraduate Medical Journal*. 2013;89(1050):202-8.
8. Cho S, Lee H, Yoon S, Kim Y, Levin PF, Kim E. Community health needs assessment: a nurses' global health project in Vietnam. *International Nursing Review*. 2018.
9. Salehi Zalani G, Bayat M, Shokri A, Mirbahaeddin SE, Rasi V, Alirezaei S, et al. Affecting Factors on the Performance of Community Health Workers in Iran's Rural Areas: A Review Article. *Iranian Journal Of Public Health*. 2016;45(11):1399-410.
10. Shelley KD, Belete YW, Phiri SC, Musonda M, Kawesha EC, Muleya EM, et al. Implementation of the Community Health Assistant (CHA) Cadre in Zambia: A Process Evaluation to Guide Future Scale-Up Decisions. *Journal Of Community Health*. 2016;41(2):398-408.
11. Couper I, Ray S, Blaauw D, Ng'wena G, Muchiri L, Oyungu E, et al. Curriculum and training needs of mid-level health workers in Africa: a situational review from Kenya, Nigeria, South Africa and Uganda. *BMC Health Services Research*. 2018;18(1):553-.
12. Sánchez Del Hierro G, Remmen R, Verhoeven V, Van Royen P, Hendrickx K. Are recent graduates enough prepared to perform obstetric skills in their rural and compulsory year? A study from Ecuador. *BMJ Open*. 2014;4(7):e005759-e.
13. Abera M, Tesfaye M, Belachew T, Hanlon C. Perceived challenges and opportunities arising from integration of mental health into primary care: a cross-sectional survey of primary health care workers in south-west Ethiopia. 2014.
14. Allen CW, Jeffery H. Implementation and evaluation of a neonatal educational program in rural Nepal. *Journal Of Tropical Pediatrics*. 2006;52(3):218-22.
15. Luo EM, Opare-Ado HS, Adomako J, Danso KA, Peltzman T, Anderson FWJ. Completing the Maternal Care Team: OB/GYN Expertise at Rural District Hospitals in Ghana, a Qualitative Study. *Maternal & Child Health Journal*. 2018;22(7):1085-91.
16. Newman DE, Shapiro MC. Obstacles faced by general practitioners in Loreto Department, Peru in pursuing residency training. *Rural And Remote Health*. 2010;10(2):1256-.
17. Husum H, Gilbert M, Wisborg T. Training pre-hospital trauma care in low-income countries: the 'Village University' experience. *Medical Teacher*. 2003;25(2):142-8.
18. Siega-Sur JL, Woolley T, Ross SJ, Reeve C, Neusy AJ. The impact of socially-accountable, community-engaged medical education on graduates in the Central Philippines: Implications for the global rural medical workforce. *Medical Teacher*. 2017;39(10):1084-91.
19. Tani K, Exavery A, Baynes CD, Pemba S, Hingora A, Manzi F, et al. Unit cost analysis of training and deploying paid community health workers in three rural districts of Tanzania. *BMC Health Services Research*. 2016;16:237-.
20. Phiri SC, Prust ML, Chibawe CP, Misapa R, van den Broek JW, Wilmink N. An exploration of facilitators and challenges in the scale-up of a national, public sector community health worker cadre in Zambia: a qualitative study. *Human Resources For Health*. 2017;15(1):40-.
21. Morgan C, Teshome M, Crocker-Buque T, Bhudia R, Singh K. Medical education in difficult circumstances: analysis of the experience of clinical medical students following the new innovative medical curriculum in Aksum, rural Ethiopia. *BMC Medical Education*. 2018;18(1):119-.
22. Van Heng Y, Davoung C, Husum H. Non-doctors as trauma surgeons? A controlled study of trauma training for non-graduate surgeons in rural Cambodia. *Prehospital And Disaster Medicine*. 2008;23(6):483-9.
23. Knettel BA, Slifko SE, Inman AG, Silova I. Training community health workers: an evaluation of effectiveness, sustainable continuity, and cultural humility in an educational program in rural Haiti. *International Journal of Health Promotion & Education*. 2017;55(4):177-88.
24. Zimmerman M, Shah S, Shakya R, Sundar Chansi B, Shah K, Munday D, et al. A staff support programme for rural hospitals in Nepal. *Bulletin Of The World Health Organization*. 2016;94(1):65-70.
25. Halili SB, Jr., Cristobal F, Woolley T, Ross SJ, Reeve C, Neusy AJ. Addressing health workforce inequities in the Mindanao regions of the Philippines: Tracer study of graduates from a socially-accountable, community-engaged medical school and graduates from a conventional medical school. *Medical Teacher*. 2017;39(8):859-65.
26. Tumbo JM, Couper ID, Hugo JFM. Rural-origin health science students at South African universities. *South African Medical Journal = Suid-Afrikaanse Tydskrif Vir Geneeskunde*. 2009;99(1):54-6.
27. Hamm J, Bodegraven PV, Bac M, Louw JM. Cost effectiveness of clinical associates: A case study for the Mpumalanga province in South Africa. *African Journal Of Primary Health Care & Family Medicine*. 2016;8(1):e1-e6.
28. Leon BK, Riise Kolstad J. Wrong schools or wrong students? The potential role of medical education in regional imbalances of the health workforce in the United Republic of Tanzania. *Human Resources For Health*. 2010;8:3-.
29. Pei H, Sun Y, Bai Z, Yu Z, Chang C, Qiu C, et al. Selective admission policy of medical undergraduates in western China: applicants' real attitudes to the choice of a rural medical career. *Rural & Remote Health*. 2018;18(4519):1-12.
30. Budhathoki SS, Zwanikken PAC, Pokharel PK, Scherpbier AJ. Factors influencing medical students' motivation to practise in rural areas in low-income and middle-income countries: a systematic review. *BMJ Open*. 2017;7(2):e013501-e.
31. Crampton PES, McLachlan JC, Illing JC. A systematic literature review of undergraduate clinical placements in underserved areas. *Medical Education*. 2013;47(10):969-78.

7-Step Checklist for Implementing Rural Pipelines- DRAFT

32. Farmer J, Kenny A, McKinstry C, Huysmans RD. A scoping review of the association between rural medical education and rural practice location. *Human Resources For Health*. 2015;13:27-.
33. Wilson NW, Couper ID, De Vries E, Reid S, Fish T, Marais BJ. A critical review of interventions to redress the inequitable distribution of healthcare professionals to rural and remote areas. *Rural And Remote Health*. 2009;9(2):1060-.
34. Verma P, Ford JA, Stuart A, Howe A, Everington S, Steel N. A systematic review of strategies to recruit and retain primary care doctors. *BMC Health Services Research*. 2016;16:126-.
35. Couper ID, Thurley JD, Hugo JFM. The neonatal resuscitation training project in rural South Africa. *Rural And Remote Health*. 2005;5(4):459-.
36. Tilahun D, Hanlon C, Araya M, Davey B, Hoekstra RA, Fekadu A. Training needs and perspectives of community health workers in relation to integrating child mental health care into primary health care in a rural setting in sub-Saharan Africa: a mixed methods study. *International Journal Of Mental Health Systems*. 2017;11:15-.
37. Mung'omba B, Botha ADH. Core competencies of radiographers working in rural hospitals of KwaZulu-Natal, South Africa. *African Journal Of Primary Health Care & Family Medicine*. 2017;9(1):e1-e8.
38. Guijie H, Yanhua Y. Is a decentralized continuing medical education program feasible for Chinese rural health professionals? *Journal of Educational Evaluation for Health Professions*. 2016;13.
39. Yi Y, Chongsuvivatwong V, Sriplung H, Rueanarong C. CPIRD: A successful Thai programme to produce clinically competent medical graduates. *F1000research*. 2015;4:158-.
40. Reid SJ, Couper ID, Volmink J. Educational factors that influence the urban-rural distribution of health professionals in South Africa: a case-control study. *South African Medical Journal = Suid-Afrikaanse Tydskrif Vir Geneeskunde*. 2011;101(1):29-33.
41. Kibore MW, Daniels JA, Child MJ, Nduati R, Njiri FJ, Kinuthia RM, et al. Kenyan medical student and consultant experiences in a pilot decentralized training program at the University of Nairobi. *Education For Health (Abingdon, England)*. 2014;27(2):170-6.
42. Kizito S, Baingana R, Mugagga K, Akera P, Sewankambo NK. Influence of community-based education on undergraduate health professions students' decision to work in underserved areas in Uganda. *BMC Research Notes*. 2017;10(1):726-.
43. Bhushan H, Bhardwaj A. Task shifting: A key strategy in the multipronged approach to reduce maternal mortality in India. *International Journal Of Gynaecology And Obstetrics: The Official Organ Of The International Federation Of Gynaecology And Obstetrics*. 2015;131 Suppl 1:S67-S70.
44. Techakehakij W, Arora R. Rural retention of new medical graduates from the Collaborative Project to Increase Production of Rural Doctors (CPIRD): a 12-year retrospective study. 2017. p. 809-15.
45. Putthasri W, Suphanchaimat R, Topothai T, Wisaijohn T, Thammatacharee N, Tangcharoensathien V. Thailand special recruitment track of medical students: a series of annual cross-sectional surveys on the new graduates between 2010 and 2012. *Human Resources For Health*. 2013;11:47-.
46. Henderson LN, Tulloch J. Incentives for retaining and motivating health workers in Pacific and Asian countries. *Human Resources For Health*. 2008;6:18-.
47. Theron GB. Improved practical skills of midwives practicing in the Eastern Cape Province of the Republic of South Africa through the study of a self-education manual. *Journal Of Perinatology: Official Journal Of The California Perinatal Association*. 2000;20(3):184-8.
48. Kaye D, Mwanika A, Burnham G, Chang LW, Mbalinda SN, Okullo I, et al. The organization and implementation of community-based education programs for health worker training institutions in Uganda. *BMC International Health And Human Rights*. 2011;11 Suppl 1:S4-S.
49. Kok MC, Dieleman M, Taegtmeier M, Broerse JEW, Kane SS, Ormel H, et al. Which intervention design factors influence performance of community health workers in low- and middle-income countries? A systematic review. 2015. p. 1207-27.
50. Moran AM, Coyle J, Pope R, Boxall D, Nancarrow SA, Young J. Supervision, support and mentoring interventions for health practitioners in rural and remote contexts: an integrative review and thematic synthesis of the literature to identify mechanisms for successful outcomes. *Human Resources For Health*. 2014;12:10-.
51. Blacklock C, Bradley DCG, Mickan S, Willcox M, Roberts N, Bergstroem 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. 2016.
52. Van Dormael M, Dugas S, Kone Y, Coulibaly S, Sy M, Marchal B, et al. Appropriate training and retention of community doctors in rural areas: a case study from Mali. *Human Resources For Health*. 2008;6:25-.
53. Vyas R, Zacharah A, Swamidasan I, Doris P, Harris I. Blended distance education program for junior doctors working in rural hospitals in India. *Rural And Remote Health*. 2014;14:2420-.
54. Rennert W, Koop E. Primary health care for remote village communities in Honduras: a model for training and support of community health workers. *Family Medicine*. 2009;41(9):646-51.
55. Wangmo S, Suphanchaimat R, Htun WMM, Tun Aung T, Khitdee C, Patcharanarumol W, et al. Auxiliary midwives in hard to reach rural areas of Myanmar: filling MCH gaps. *BMC Public Health*. 2016;16(1):914-.
56. Ludwick T, Turyakira E, Kyomuhangi T, Manalili K, Robinson S, Brenner JL. Supportive supervision and constructive relationships with healthcare workers support CHW performance: Use of a qualitative framework to evaluate CHW programming in Uganda. *Human Resources For Health*. 2018;16(1):11-.
57. Ndimba SD, Sidat M, Give C, Ormel H, Kok MC, Taegtmeier M. Supervision of community health workers in Mozambique: a qualitative study of factors influencing motivation and programme implementation. *Human Resources For Health*. 2015;13:63-.
58. Cavender A, Albán M. Compulsory medical service in Ecuador: the physician's perspective. *Social Science & Medicine (1982)*. 1998;47(12):1937-46.
59. Liu J, Zhang K, Mao Y. Attitude towards working in rural areas: a cross-sectional survey of rural-oriented tuition-waived medical students in Shaanxi, China. *BMC Medical Education*. 2018;18(1):91-.
60. 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. *Human Resources For Health*. 2015;13:58-.
61. Kawasaki R, Sadamori T, Ferreira de Almeida T, Akiyoshi M, Nishihara M, Yoshimura T, et al. Reactions of community members regarding community health workers' activities as a measure of the impact of a training program in Amazonas, Brazil. *Journal Of Rural Medicine: JRM*. 2015;10(1):7-19.

7-Step Checklist for Implementing Rural Pipelines- DRAFT

62. Rabbani F, Shipton L, Aftab W, Sangrasi K, Perveen S, Zahidie A. Inspiring health worker motivation with supportive supervision: a survey of lady health supervisor motivating factors in rural Pakistan. *BMC Health Services Research*. 2016;16(1):397-.
63. Mboineki JF, Zhang W. Healthcare Provider Views on Transitioning From Task Shifting to Advanced Practice Nursing in Tanzania. *Nursing Research*. 2018;67(1):49-54.
64. Tshering D, Tejavivaddhana P, Briggs D, Wangmo N. Factors affecting motivation and retention of village health workers and recommended strategies: A systematic review from 11 developing countries. *Asia Pacific Journal of Health Management*. 2018(2):1.
65. Barnett S, Jones SC, Bennett S, Iverson D, Bonney A. General practice training and virtual communities of practice - a review of the literature. *BMC Family Practice*. 2012;13:87-.
66. Van Wieren A, Palazuelos L, Elliott PF, Arrieta J, Flores H, Palazuelos D. Service, training, mentorship: first report of an innovative education-support program to revitalize primary care social service in Chiapas, Mexico. *Global Health Action*. 2014;7:25139-.
67. Curran V, Rourke L, Snow P. A framework for enhancing continuing medical education for rural physicians: A summary of the literature. *Medical Teacher*. 2010;32(11):e501-e8.
68. Mbemba G, Gagnon M-P, Pare G, Cote J. Interventions for supporting nurse retention in rural and remote areas: an umbrella review. 2013.
69. Arifeen S, Rahman M, Chowdhury E, Haque T, Begum K, Hossain M, et al. Improving and sustaining quality of child health care through IMCI training and supervision: experience from rural Bangladesh. *Health policy and planning*. 2014;29(6):753-62.
70. Saab BR, Kanaan N, Hamadeh G, Usta J. Postgraduate educational program for primary care physicians in remote areas in Lebanon. *The Journal Of Continuing Education In The Health Professions*. 2003;23(3):168-72.
71. Ajeani J, Mangwi Ayiasi R, Tetui M, Ekirapa-Kiracho E, Namazzi G, Muhumuza Kananura R, et al. A cascade model of mentorship for frontline health workers in rural health facilities in Eastern Uganda: processes, achievements and lessons. *Global Health Action*. 2017;10(sup4):1345497-.
72. Butterworth K, Hayes B, Zimmerman M. Remote and rural: do mentors enhance the value of distance learning continuing medical education? *Education For Health (Abingdon, England)*. 2011;24(3):539-.
73. Li H, Wang Z, Jiang N, Liu Y, Wen D. Lifelong learning of Chinese rural physicians: preliminary psychometrics and influencing factors. *BMC Medical Education*. 2015;15:192-.
74. Nqala MO, Rout CC, Aldous CM. Remote clinical support by telephone for rural district hospital medical officers in the Eastern Cape. *South African Family Practice*. 2015;57(5):286-90.
75. Chib A, Tran Khanh P, Si CW, Hway NS. Enabling informal digital guanxi for rural doctors in Shaanxi, China. 2013. p. 62-80.
76. Vyas R, Zachariah A, Swamidasan I, Doris P, Harris I. Integration of academic learning and service development through guided projects for rural practitioners in India. *Medical Teacher*. 2011;33(7):e401-e7.
77. Vyas R, Zachariah A, Swamidasan I, Doris P, Harris I. A networking approach to reduce academic and social isolation for junior doctors working in rural hospitals in India. *Education For Health (Abingdon, England)*. 2012;25(1):70-4.
78. Rusatira JC, Tomaszewski B, Dusabejamba V, Ndayiragije V, Gonsalves S, Sawant A, et al. Enabling Access to Medical and Health Education in Rwanda Using Mobile Technology: Needs Assessment for the Development of Mobile Medical Educator Apps. *JMIR Medical Education*. 2016;2(1):e7-e.
79. Li X, Shen JJ, Yao F, Jiang C, Chang F, Hao F, et al. Does exam-targeted training help village doctors pass the certified (assistant) physician exam and improve their practical skills? A cross-sectional analysis of village doctors' perspectives in Changzhou in Eastern China. 2018.
80. Dolea C, Stormont L, Braichet J-M. Evaluated strategies to increase attraction and retention of health workers in remote and rural areas. 2010. p. 379-85.
81. 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. *Human Resources For Health*. 2014;12:14-.
82. Thapa KR, Shrestha BK, Bhattarai MD. Study of working experience in remote rural areas after medical graduation. *Kathmandu University Medical Journal (KUMJ)*. 2014;12(46):121-5.