

# Interventions for managing the movement of health workers between public and private organizations in low- and middle-income countries

## Protocol information

### Authors

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### What's new

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### History

Date	Event	Description
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## Abstract

### Background

### Objectives

### Search methods

### Selection criteria

### Data collection and analysis

### Main results

### Authors' conclusions

## Plain language summary

### [Plain language title]

[Summary text]

## Background

Health workers migrate between the public and the private sector due to many factors including seeking better pay, job security, better working conditions and career opportunities ([McCoy 2008](#); [Nguyen 2008](#); [Schrecker 2004](#)). The public sector is the government-funded healthcare delivery system while the private sector can be either non-profit making, such as non-governmental organizations (NGOs), or profit-making privately owned clinics and hospitals. The private sector has been expanding in many low- and middle-income countries and is now responsible for a large proportion of health care in many

settings. However, governments in many low- and middle-income countries lack the capacity to enforce regulatory control of the private sector ([Brugha 1998](#)). The private sector also lacks the capacity to address public health challenges and is to a large extent inaccessible to the lowest socio-economic groups ([Palmer 2003](#)).

A number of factors have been reported to affect the movement of health workers between the public and private sectors in low- and middle-income countries. In Namibia, for example, the presence of fringe benefits and conditions of service has been shown to pull and retain workers in the public sector while high salaries and "soft tissues" such as recognition and communication tend to pull and retain workers in the private sector ([Lipinge 2006](#)). In South Africa, high workload and low motivation in the public sector pushes health workers from the public to the private sector ([Pillay 2009](#)). In Mozambique, the many job opportunities created in NGOs and the reduced workload, closer supervision and better equipment offered by these organisations have been shown to pull workers to the private sector ([Pfeiffer 2003](#); [Pfeiffer 2008](#)). In addition, public health reforms that reduce the workforce tend to push workers away from the public sector in low-income countries ([Lethbridge 2004](#)). It is critical therefore that financial and non-financial interventions be evaluated for their effect on movement of health workers between the public and private sectors.

### Description of the condition

The movement of health workers from the public to the private sector results, firstly, in large discrepancies in the populations served by these sectors, with a larger proportion of health workers serving a smaller proportion of the population who can access the private sector ([Sarkin 2000](#)). In South Africa in 1998, for instance, 52.7% of all general practitioners and 76% of all specialists worked in the private health sector. By 1999, reports suggested that the proportion of general practitioners working in the private sector had increased to 73% yet the private sector catered for less than 20% of the population ([Goudge 2001](#)). Secondly, the migration of health workers from the public to the private sector weakens a country's health system, especially the fragile health systems of low-income countries. In addition to the public sector being depleted of human resources, there is an increased management burden of co-ordinating various NGOs and other providers delivering services in a fragmented system ([Pfeiffer 2008](#)). Thirdly, NGOs offer time-limited projects that use incentives to attract workforce from the public sector. This creates a health workforce that lacks organizational commitment as they move from organization to organization in pursuit of better salaries but with no job security. This loss of organizational commitment may result in a money-driven ethos among health care providers, with less regard for public good or organizational and professional commitment.

A number of interventions have been tried to reduce the migration of health workers from the public to the private sector or to replace workers who have left the public sector. One approach to replacing health workers who have left the public sector has been to increase the number of health workers trained. This, however, may not be effective if there is an increasing outward migration from the public to the private sector ([Walt 2002](#)). There have been attempts to recruit more workers into the public sector from amongst those working in the private sector. However, recruiting health workers into dysfunctional health systems that are not capable of attracting and retaining staff will not solve shortages ([Kingma 2007](#)). Some governments have also restricted health workers from leaving the public sector. It has been noted, though, that efforts to restrict migration need to address the views of both the public and private sectors or else tensions are inevitable ([Walt 2002](#)). For example, the private sector may see such restrictions as unfair competition. Government restrictions, it can also be argued, interfere with personal autonomy and health workers' rights to economic prosperity ([Muula 2005](#)).

Retention of staff in rural areas has been addressed through various means, for instance through binding newly qualified health workers to work in the public sector for a number of years and by recruiting foreign doctors to work in hard-to-reach areas ([Grobler 2009](#)). The retention of nurses in the public sector has also been enhanced through supportive organizational policies and by improving educational opportunities ([Hayes 2010](#)). Financial incentives have also been used to attract and retain workers in underserved areas ([Barnighausen 2009](#); [Willis-Shattuck 2008](#)).

Both the public and the private sector have a role to play in low- and middle-income countries, especially where systems to deliver health services are weak but there is an urgent need to implement high priority interventions. There are a number of examples of involving the private sector in the delivery of high priority interventions. For example, in Kenya, using private providers increased access to treatment for febrile children ([Amin 2003](#); [Goodman 2006](#)). In Botswana, the roll-out of antiretroviral treatment involved deliberate inclusion of the private sector to implement the intervention and this reduced the workload of the public sector ([Dreesch 2007](#)). The private sector may also introduce expertise in marketing and distribution systems in health delivery systems; an area that is weak in the public sector ([Widdus 2001](#)). However, private sector expertise should not be utilized at the expense of weakening the public sector. In attempts to tap private sector expertise, the private sector may be given more tasks and may expand by recruiting more workers to shoulder the increased responsibility. As the private sector recruits from the available workforce, it depletes public sector human resources. This is because the private sector recruits mostly from people who are already employed in public or other private organizations ([van Rensburg 2008](#)).

In summary, the current shortage human resources crisis, particularly in low- and middle-income countries, and the urgent need to deliver services and build sustainable health systems ([World Health Organization 2006](#)), make interventions to manage the movement of health workers between the public and the private sector important. Such interventions may have consequences for short, medium and long-term healthcare provision in low- and middle-income countries.

### Description of the intervention

We will consider interventions that affect the movement of health workers between public and private health organizations. These will include, among others, the following.

1. Payment of special allowances to health workers working in the public or private sector.

2. Increasing salaries for public or private sector workers.
3. Bonding health workers for a number of years after training.
4. Bursary schemes where the recipients are required to work in the public or private sector.
5. Giving scholarships for specialization to those in public or private sector.
6. Giving lucrative terminal benefits to those who serve in the public or private sector for a certain number of years.
7. Hiring personnel on a contract basis. These high salaries for contract work would be comparable to the salaries paid in the other sector, which may be public or private.

The comparison groups will be those health workers in the same sector who have not received a particular intervention.

### How the intervention might work

These interventions work in two ways. The first is through making the particular sector more lucrative, such as by payment of special allowances, increasing salaries, giving scholarships, giving lucrative terminal benefits and hiring people on contract and hence giving them higher salaries. The second way is through restricting the outflow of health workers by bonding health workers for a certain time before they are available to move to other places of work.

### Why it is important to do this review

The movement of health workers from the public to the private sector, or from the private sector to the public sector, affects the equity, accessibility and sustainability of health services. The migration of health workers from the public sector to the private sector may lead to shortages of health workers in public health facilities. Health inequities are also likely to be widened where the public sector that serves the majority of people is understaffed, while the private sector has adequate health workers but caters for few people. Equity may also be worsened where the private sector is the predominant supplier in rural areas and health workers migrate from it to the public sector, which may not have many facilities in these areas. The larger part of the population (this time in the rural areas) is then served by fewer health workers. The migration of health workers between the public and the private sector also raises issues of sustainability. For instance, in the wake of the rolling out of HIV services in countries with weak health systems, the private sector expanded greatly to provide HIV/AIDS care, often with the support of international donors who aimed to reach a high number of people with HIV. Though this led to a big increase in the number of people accessing care in the short term, it also led to an exodus of public sector health workers to the private sector, further weakening already weak health systems. In the long run, private-led service provision with a weakened public health care system is not sustainable. It is therefore important to regulate the movement of health workers so as not to create an imbalance that would be detrimental to service delivery in the long term.

## Objectives

To determine the effects of interventions to manage the movement of health workers between public and private organizations in low- and middle-income countries.

## Methods

### Criteria for considering studies for this review

#### *Types of studies*

We will consider randomized controlled trials and non-randomized controlled trials for inclusion. We will also consider controlled before-after studies if the pre and post-intervention periods for study and control groups are the same and there are at least two units included in both the intervention and control groups. We will also consider controlled interrupted time series and interrupted time series studies without controls. We will consider interrupted time series analyses if the point in time when the intervention occurred is clearly defined and there are at least three data points both before and after the intervention.

#### *Types of participants*

We will include all health professionals employed in the public and private sector in low- and middle-income countries, including physicians, nurses, midwives, nursing assistants, pharmacists, physiotherapists, occupational therapists, dentists, laboratory technicians and radiologists. We will also include support staff, such as managers, accountants and cleaners. We will exclude community or village health workers who are not clearly categorized as formally employed health workers. However, if the community/lay health workers are employed by the state and are part of the civil service providing health services, we will include them in the review.

#### *Types of interventions*

These are as follows.

1. Financial interventions, such as payment of special allowances, increasing salaries, offering bursary schemes, scholarships or lucrative terminal benefits to those who would have served a certain continuous period in the public or private sector.
2. Putting in place a minimum number of years a graduate needs to serve in the public sector or in private sector organizations based in rural areas before the health worker is allowed to look for employment elsewhere. This could be done through bonding, with the intention of delaying the depletion of the public sector or the rural private sector workforce.
3. Hiring the health workers on a contract basis so that the salaries paid to those on a contract can match the high salaries that are paid in other organizations. These interventions have the intention of reducing the migration of health workers who may be attracted by high salaries in another sector.

## **Types of outcome measures**

### **Primary outcomes**

The primary outcomes will be (1) a change in the numbers or proportion of health workers entering or leaving the public or private sectors; and (2) the duration of stay in a particular sector.

### **Secondary outcomes**

Secondary outcomes will include the distribution of health workers between the public and private sectors and work satisfaction among health workers in the public and the private sectors.

## **Search methods for identification of studies**

Related systematic reviews will be identified by searching the Database of Abstracts of Reviews of Effectiveness (DARE). Studies will be identified using the following bibliographic databases, sources, and approaches.

### **Electronic searches**

We will search the following databases for primary studies:

1. the Cochrane Central Register of Controlled Trials (CENTRAL), part of *The Cochrane Library*, [www.thecochranelibrary.com](http://www.thecochranelibrary.com), including the Cochrane Effective Practice and Organisation of Care (EPOC) Specialised Register;
2. MEDLINE, Ovid (1947 - );
3. EMBASE, Ovid (1980 - );
4. LILACS, VHL;
5. British Nursing Index, Ovid (1985 - ).

Full search strategies are shown in [Appendix 1](#); [Appendix 2](#); [Appendix 3](#); [Appendix 4](#) and [Appendix 5](#).

### **Searching other resources**

We will search reference lists of all included studies and of any relevant reviews identified. We will also search the Science Citation Index and Social Sciences Citation Index, ISI Web of Science for papers which cite studies included in the review and the WHO International Clinical Trials Registry for ongoing trials.

## **Data collection and analysis**

### **Selection of studies**

We will upload records retrieved from the searches into EndNote and screen them for duplicates. Two independent review authors (ER and AAK) will then apply the inclusion and exclusion criteria. We will retrieve full copies of all articles selected as eligible by either of the review authors. The two review authors will then independently determine if these studies meet the review inclusion criteria. We will list in the table 'Characteristics of excluded studies' those studies that initially appear to meet the inclusion criteria but are later excluded based on review of the full text. This table will also give reasons for their exclusion. Disagreements between the two review authors will be resolved through discussion with a third review author (SNK or FS or GWP).

### **Data extraction and management**

One review author (ER) will extract data from the included studies. A second review author (AAK) will independently cross-check and confirm this process. We will develop a data extraction form based on that used by the Cochrane EPOC Group. We will extract information on study design, type of intervention, duration of intervention, participants (this will include the numbers in each group, for instance the number of doctors in an organization), context or setting (which will include the country or region within the country), and numbers or proportion of health workers entering or leaving the organizations. We will extract all relevant outcomes from the included studies.

### **Assessment of risk of bias in included studies**

We will use the Cochrane EPOC Group 'Risk of bias' checklists for randomized controlled trials (RCTs), non-randomized controlled trials and controlled before-after (CBA) studies, as well as the Group's checklist for interrupted time series studies, to determine the risk of bias for all eligible studies. These 'Risk of bias' checklists are available at: <http://epocoslo.cochrane.org/epoc-specific-resources-review-authors>.

### **Measures of treatment effect**

We will measure the effects of the interventions based on changes in absolute numbers and relative changes (percentage change) in the numbers of health workers working in the private or public sectors. We will use relative risk for dichotomous outcomes and mean differences for continuous outcomes.

### **Unit of analysis issues**

For those cluster-randomized studies which do not adequately account for clustering in their analysis, we will adjust the analysis for clustering if the following information can be extracted:

1. the number of clusters (or groups) randomized to each intervention group, or the average (mean) size of each cluster;
2. the outcome data ignoring the cluster design for the total number of individuals included in the study (for example, number or proportion of individuals with events, or means and standard deviations); and

Interventions for managing the movement of health workers between public and private organizations in low- and middle...

3. an estimate of the intracluster (or intraclass) correlation coefficient (ICC). Where no information on the intra-cluster correlation coefficient (ICC) is reported, we will extrapolate the ICC from other cluster RCTs, if available. If this is not possible, we will not combine the findings of these studies in a meta-analysis, but will present the results in an additional table.

We will use inflated variances to adjust properly for clustering ([Higgins 2011](#)). We will also assess included CBA and ITS studies for unit of analysis issues and, if these are present, adjust accordingly.

### ***Dealing with missing data***

We will contact authors of included studies for missing data. We will assess these data to see whether they change the results of the trial or are inconsistent with the findings. If there are missing data but the study authors are not able to provide these, we will only analyze available data. We will use intention-to-treat analysis in which all randomised participants are analysed in the groups to which they were originally assigned. We will exclude data obtained from authors of included studies in sensitivity analyses.

### ***Assessment of heterogeneity***

We consider whether there is substantive heterogeneity of settings, interventions or outcomes among the included studies.

When the observed intervention effects are more different from each other than one would expect due to chance alone, we will assume that the studies have clinical and / or statistical heterogeneity. We will obtain an initial visual overview of heterogeneity through scrutinising the forest plots, looking at the overlap between confidence intervals around the effect estimate for each included study. Heterogeneity will be taken as present when the p value for the Cochran Q-test is less than 0.10.

To quantify the inconsistency across studies, and thus the impact of heterogeneity on the meta-analysis, we will use the  $I^2$  statistic, based on the overlapping intervals approach recommended in the Cochrane Handbook for Systematic Reviews of Interventions ([Higgins 2011](#)).

### ***Assessment of reporting biases***

We will prepare and assess a funnel plot for signs of asymmetry. Using a visual inspection of the plot, we will consider publication bias as one of the possible explanations for any asymmetry noted. We do not intend to perform any statistical testing for funnel plot asymmetry.

### ***Data synthesis***

For each study meeting our inclusion criteria, we will report the main results in natural units. We will present the results for comparisons using a standard method of presentation where possible. We will prepare tables and forest plots comparing the effect estimates for each included study by type of intervention. If meta-analysis is appropriate, we will use a random-effects model because of a high likelihood of heterogeneity in both interventions and outcomes. For all data syntheses we will use the generic inverse-variance method of analysis as this allows the analysis of continuous and dichotomous data and allows clustered and non-clustered data to be combined. We will report the results separately for RCTs and non-randomised studies. We will also re-analyse data from ITS (including cITS) and CBA studies if they have not been analysed appropriately in the original studies. If meta-analysis is not possible due to heterogeneity of settings, interventions or outcomes, we will report the results narratively.

### **Summarising and interpreting results**

We will use the GRADE approach to assess the quality of evidence related to each of the key outcomes ([Schunemann 2011](#)). We will use the GRADE profiler ([GRADEpro 2008](#)) to import data from Review Manager and create 'Summary of findings' tables.

We will use these assessments, along with the evidence for benefit or harm for the key outcomes and comparisons in the review, to draw conclusions about the effectiveness of interventions for managing the movement of health workers between public and private organisations in low- and middle-income countries.

### ***Subgroup analysis and investigation of heterogeneity***

We will perform subgroup analyses to check if the intervention effect varies with different population or intervention characteristics. We will prepare tables and forest plots comparing the effect sizes of studies grouped according to potential effect modifiers. These effect modifiers will include:

1. type of intervention;
2. duration of intervention;
3. outcomes used to assess the effects of the intervention;
4. type of health professional to whom the intervention is directed;
5. level of intervention;
6. context of intervention, e.g. whether the intervention was implemented in a low or middle income country.

### ***Sensitivity analysis***

We will consider carrying out the following sensitivity analyses:

1. Excluding all studies where additional data have been obtained from the authors.
2. Excluding the data obtained from cluster-randomized trials.
3. Based on varying the intracluster (or intraclass) correlation coefficient (ICC) used to adjust results from cluster-

randomized trials.

## Results

Description of studies

*Results of the search*

*Included studies*

*Excluded studies*

Risk of bias in included studies

*Allocation (selection bias)*

*Blinding (performance bias and detection bias)*

*Incomplete outcome data (attrition bias)*

*Selective reporting (reporting bias)*

*Other potential sources of bias*

Effects of interventions

## Discussion

Summary of main results

Overall completeness and applicability of evidence

Quality of the evidence

Potential biases in the review process

Agreements and disagreements with other studies or reviews

## Authors' conclusions

Implications for practice

Implications for research

## Acknowledgements

## Contributions of authors

## Declarations of interest

None known.

## Differences between protocol and review

## Published notes

## Characteristics of studies

Characteristics of included studies

*Footnotes*

Characteristics of excluded studies

*Footnotes*

Characteristics of studies awaiting classification

*Footnotes*

Characteristics of ongoing studies

*Footnotes*

## Summary of findings tables

## Additional tables

## References to studies

Included studies

Excluded studies

## Studies awaiting classification

## Ongoing studies

## Other references

### Additional references

#### ***Amin 2003***

Amin AA, Marsh V. The use of formal and informal curative services in the management of paediatric fevers in four districts in Kenya. *Tropical Medicine International Health* 2003;8(12):1143-52.

#### ***Barnighausen 2009***

Barnighausen T, Bloom DE. Financial incentives for return of service in underserved areas: a systematic review. *BMC Health Services Research* 2009;9(86):<http://www.biomedcentral.com/1472-6963/9/86/>.

#### ***Brugha 1998***

BrughaR, Zwi A. Improving the quality of private sector delivery of public health services: challenges and strategies. *Health Policy and Planning* 1998;13(2):107-20.

#### ***Dreesch 2007***

Dreesch N, Nyoni J. Public-private options for expanding access to human resources for HIV/AIDS in Botswana. *Human Resources for Health* 2007;5(25):<http://www.human-resources-health.com/content/5/1/25>.

#### ***Goodman 2006***

Goodman CA, Mutemi WM. The cost-effectiveness of improving malaria home management: shopkeeper training in rural Kenya. *Health Policy and Planning* 2006;21(4):275-88.

#### ***Goudge 2001***

Goudge J, Cornell J. Private sector financing. In: *South African Health Review*. Durban: Health Systems Trust, 2001.

#### ***GRADEpro 2008***

GRADEpro. [Computer program]. Version 3.2 for Windows. Jan Brozek, Andrew Oxman, Holger Schünemann. 2008.

#### ***Grobler 2009***

Grobler L, Marais BJ, Mabunda SA, Marindi PN, Reuter H, Volmink J. Interventions for increasing the proportion of health professionals practising in rural and other underserved areas. *Cochrane Database of Systematic Reviews* 2009, Issue 1. Art. No.: CD005314 DOI: 10.1002/14651858.CD005314.pub2.

#### ***Hayes 2010***

Hayes B, Bonner A, Pryor J. Factors contributing to nurse job satisfaction in the acute hospital setting: a review of recent literature. *Journal of Nursing Management* 2010;18(7):804-14.

#### ***Higgins 2011***

Higgins JPT, Green S (editors). *Cochrane Handbook for Systematic Reviews of Interventions* Version 5.1.0 [updated March 2011]. The Cochrane Collaboration. Available from [www.cochrane-handbook.org](http://www.cochrane-handbook.org), 2011.

#### ***Kingma 2007***

Kingma M. Nurses on the move: a global overview. *Health Services Research* 2007;42(3 Pt 2):1281-98.

#### ***Lethbridge 2004***

Lethbridge J. Public sector reform and demand for human resources for health (HRH). *Human Resources for Health* 2004;2(1):15.

#### ***Lipinge 2006***

Lipinge SN, Hofnie K. Perceptions of health workers about conditions of service: a Namibian case study. *Regional Network for Equity in Health in Southern Africa (EQUINET)* 2006.

#### ***McCoy 2008***

McCoy D, Bennett S. Salaries and incomes of health workers in sub-Saharan Africa. *Lancet* 2008;371(9613):675-81.

#### ***Muula 2005***

Muula AS. Is there any solution to the "brain drain" of health professionals and knowledge from Africa? *Croatian Medical Journal* 2005;46(1):21-9.

#### ***Nguyen 2008***

Nguyen L, Ropers S. Intent to migrate among nursing students in Uganda: measures of brain drain in the next generation of health professionals. *Human Resources for Health* 2008;6(5):<http://www.human-resources-health.com/content/6/1/5>. [10.1186/1478-4491-6-5]

### ***Palmer 2003***

Palmer N, Mills A, Wade H, Gilson L, Schneider H. A new face for private providers in developing countries: what implications for public health? *Bulletin of the World Health Organization* 2003;81(4):292-7.

### ***Pfeiffer 2003***

Pfeiffer J. International NGOs and primary health care in Mozambique: the need for a new model of collaboration. *Social Science Medicine* 2003;56(4):725-38.

### ***Pfeiffer 2008***

Pfeiffer J, Johnson W. Strengthening health systems in poor countries: a code of conduct for non governmental organizations. *American Journal of Public Health* 2008;98(12):2134-40.

### ***Pillay 2009***

Pillay R. Work satisfaction of professional nurses in South Africa: a comparative analysis of the public and private sectors. *Human Resources for Health* 2009;7(15):<http://www.human-resources-health.com/content/7/1/15>.

### ***Sarkin 2000***

Sarkin J. A review of health and human rights after five years of democracy in South Africa. *Medical Law* 2000;19(2):287-307.

### ***Schrecker 2004***

Schrecker T, Labonte R. Taming the brain drain: a challenge for public health systems in Southern Africa. *International Journal of Occupational and Environmental Health* 2004;10(4):409-15.

### ***Schunemann 2011***

Schünemann HJ, Oxman AD, Vist GE, Higgins JPT, Deeks JD, Glasziou P, Guyatt GH, on behalf of the Cochrane Applicability and Recommendations Methods Group. Interpreting results and drawing conclusions. In: Higgins JPT, Green S (editors). *Cochrane Handbook for Systematic Reviews of Interventions* Version 5.1.0 [updated March 2011]. The Cochrane Collaboration, Available from [www.cochrane-handbook.org](http://www.cochrane-handbook.org), 2011.

### ***van Rensburg 2008***

van Rensburg DH, Steyn F. Human resource development and antiretroviral treatment in Free State province South Africa. *Human Resources for Health* 2008;6(15):<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2531133/>.

### ***Walt 2002***

Walt G, Antonius R. The historical development of human resources policies in the health sector of Caribbean territories: imitated or created? *Health Policy* 2002;62(1):85-101.

### ***Widdus 2001***

Widdus R. Public-private partnerships for health: their main targets, their diversity, and their future directions. *Bulletin of World Health Organization* 2001;79(8):713-20.

### ***Willis-Shattuck 2008***

Willis-Shattuck M, Bidwell P, Thomas S, Wyness L, Blaauw D, Ditlopo P. Motivation and retention of health workers in developing countries: a systematic review. *BMC Health Services Research* 2008;8(247):<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2612662/>.

### ***World Health Organization 2006***

World Health Organization. *Working Together For Health: The World Health Report 2006*. Geneva: World Health Organization, 2006.

## **Other published versions of this review**

## **Classification pending references**

## **Data and analyses**

## **Figures**

## **Sources of support**

### **Internal sources**

- No sources of support provided

### **External sources**

- No sources of support provided

## **Feedback**



## Appendices

### 1 CENTRAL search strategy

#1	<a href="#">MeSH descriptor Emigration and Immigration, this term only</a>
#2	<a href="#">MeSH descriptor Population Dynamics, this term only</a>
#3	<a href="#">MeSH descriptor Residential Mobility, this term only</a>
#4	<a href="#">MeSH descriptor Transients and Migrants, this term only</a>
#5	<a href="#">MeSH descriptor Career Choice, this term only</a>
#6	<a href="#">MeSH descriptor Employment, this term only</a>
#7	<a href="#">MeSH descriptor Workplace, this term only</a>
#8	<a href="#">MeSH descriptor Personnel Selection, this term only</a>
#9	<a href="#">MeSH descriptor Personnel Staffing and Scheduling, this term only</a>
#10	<a href="#">MeSH descriptor Personnel Turnover, this term only</a>
#11	<a href="#">(transfer* or movement* or move or moving or migrat* or emigrat* or immigrat*):ti,ab,kw in Clinical Trials</a>
#12	<a href="#">((workplace or work place or job? or career? or employment) NEAR/3 (transfer* or chang* or shift* or swop* or swap* or interchang* or switch* or shuffl*)):ti,ab,kw in Clinical Trials</a>
#13	<a href="#">(brain NEXT drain):ti,ab,kw in Clinical Trials</a>
#14	<a href="#">(human resource*):ti,ab,kw in Clinical Trials</a>
#15	<a href="#">((health* or medical or hospital or primary care) NEAR/3 (manpower or man power or workforce or work force or staff*)):ti,ab,kw in Clinical Trials</a>
#16	<a href="#">((distribut* or retain* or retention or recruit* or remain*) NEAR/6 (manpower or man power or workforce or work force or employee? or staff* or worker? or laborer? or labourer? or personnel)):ti,ab in Clinical Trials</a>
#17	<a href="#">(#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR ( # AND 8 ) OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16)</a>
#18	<a href="#">MeSH descriptor Private Sector, this term only</a>
#19	<a href="#">MeSH descriptor Hospitals, Private explode all trees</a>
#20	<a href="#">MeSH descriptor Private Practice, this term only</a>
#21	<a href="#">private:ti,ab in Clinical Trials</a>
#22	<a href="#">(#18 OR #19 OR #20 OR #21)</a>
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#24	<a href="#">MeSH descriptor Hospitals, Public explode all trees</a>
#25	<a href="#">MeSH descriptor State Medicine, this term only</a>
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#27	<a href="#">(#23 OR #24 OR #25 OR #26)</a>
#28	<a href="#">(#22 OR #27)</a>
#29	<a href="#">MeSH descriptor Developing Countries, this term only</a>
#30	<a href="#">(Africa or Asia or Caribbean or West indies or South America or Latin America or Central America):ti,ab,kw in Clinical Trials</a>
#31	<a href="#">(Afghanistan or Albania or Algeria or Angola or Antigua or Barbuda or Argentina or Armenia or Armenian or Aruba or Azerbaijan or Bahrain or Bangladesh or Barbados or Benin or Byelarus or Byelorussian or Belarus or Belorussian or Belorussia or Belize or Bhutan or Bolivia or Bosnia or Herzegovina or Hercegovina or Botswana or Brazil or Bulgaria or "Burkina Faso" or "Burkina Fasso" or "Upper Volta" or Burundi or Urundi or Cambodia or "Khmer Republic" or Kampuchea or Cameroon or Cameroons or Cameron or Camerons or "Cape Verde" or "Central African Republic" or Chad or Chile or China or Colombia or Comoros or "Comoro Islands" or Comores or Mayotte or Congo or Zaire or "Costa Rica" or "Cote d'Ivoire" or "Ivory Coast" or Croatia or Cuba or Cyprus or Czechoslovakia or "Czech Republic" or Slovakia or "Slovak Republic"):ti,ab,kw in Clinical Trials</a>

#32	<a href="#">(Djibouti or "French Somaliland" or Dominica or "Dominican Republic" or "East Timor" or "East Timor" or "Timor Leste" or Ecuador or Egypt or "United Arab Republic" or "El Salvador" or Eritrea or Estonia or Ethiopia or Fiji or Gabon or "Gabonese Republic" or Gambia or Gaza or Georgia or Georgian or Ghana or "Gold Coast" or Greece or Grenada or Guatemala or Guinea or Guam or Guiana or Guyana or Haiti or Honduras or Hungary or India or Maldives or Indonesia or Iran or Iraq or "Isle of Man" or Jamaica or Jordan or Kazakhstan or Kazakh or Kenya or Kiribati or Korea or Kosovo or Kyrgyzstan or Kirghizia or "Kyrgyz Republic" or Kirghiz or Kirgizstan or "Lao PDR" or Laos or Latvia or Lebanon or Lesotho or Basutoland or Liberia or Libya or Lithuania):ti,ab,kw in Clinical Trials</a>
#33	<a href="#">(Macedonia or Madagascar or "Malagasy Republic" or Malaysia or Malaya or Malay or Sabah or Sarawak or Malawi or Nyasaland or Mali or Malta or "Marshall Islands" or Mauritania or Mauritius or "Agalega Islands" or Mexico or Micronesia or "Middle East" or Moldova or Moldavia or Moldovan or Mongolia or Montenegro or Morocco or Ifni or Mozambique or Myanmar or Myanma or Burma or Namibia or Nepal or "Netherlands Antilles" or "New Caledonia" or Nicaragua or Niger or Nigeria or "Northern Mariana Islands" or Oman or Muscat or Pakistan or Palau or Palestine or Panama or Paraguay or Peru or Philippines or Philipines or Phillipines or Phillippines or Poland or Portugal or "Puerto Rico"):ti,ab,kw in Clinical Trials</a>
#34	<a href="#">(Romania or Rumania or Roumania or Russia or Russian or Rwanda or Ruanda or "Saint Kitts" or "St Kitts" or Nevis or "Saint Lucia" or "St Lucia" or "Saint Vincent" or "St Vincent" or Grenadines or Samoa or "Samoan Islands" or "Navigator Island" or "Navigator Islands" or "Sao Tome" or "Saudi Arabia" or Senegal or Serbia or Montenegro or Seychelles or "Sierra Leone" or Slovenia or "Sri Lanka" or Ceylon or "Solomon Islands" or Somalia or Sudan or Suriname or Surinam or Swaziland or Syria or Tajikistan or Tadjhikistan or Tadjikistan or Tadjhik or Tanzania or Thailand or Togo or "Togolese Republic" or Tonga or Trinidad or Tobago or Tunisia or Turkey or Turkmenistan or Turkmen or Uganda or Ukraine or Uruguay or USSR or "Soviet Union" or "Union of Soviet Socialist Republics" or Uzbekistan or Uzbek or Vanuatu or "New Hebrides" or Venezuela or Vietnam or "Viet Nam" or "West Bank" or Yemen or Yugoslavia or Zambia or Zimbabwe or Rhodesia):ti,ab,kw in Clinical Trials</a>
#35	<a href="#">(developing or less* NEXT developed or "under developed" or underdeveloped or "middle income" or low* NEXT income or underserved or "under served" or deprived or poor*) NEXT (countr* or nation* or population* or world):ti,ab,kw in Clinical Trials</a>
#36	<a href="#">(developing or less* NEXT developed or "under developed" or underdeveloped or "middle income" or low* NEXT income) NEXT (economy or economies):ti,ab,kw in Clinical Trials</a>
#37	<a href="#">low* NEXT (gdp or gnp or "gross domestic" or "gross national"):ti,ab,kw in Clinical Trials</a>
#38	<a href="#">(low NEAR/3 middle NEAR/3 countr*):ti,ab,kw in Clinical Trials</a>
#39	<a href="#">(lmic or Imics or "third world" or "lami country" or "lami countries"):ti,ab,kw in Clinical Trials</a>
#40	<a href="#">("transitional country" or "transitional countries"):ti,ab,kw in Clinical Trials</a>
#41	<a href="#">(#29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35 OR #36 OR #37 OR #38 OR #39 OR #40)</a>
#42	<a href="#">(#17 AND #28 AND #41)</a>

## 2 MEDLINE Ovid search strategy

1. "Emigration and Immigration"/
2. Population Dynamics/
3. Residential Mobility/
4. "Transients and Migrants"/
5. Career Choice/
6. Employment/
7. Workplace/
8. Personnel Selection/
9. "Personnel Staffing and Scheduling"/
10. Personnel Turnover/
11. (transfer\* or movement\* or move or moving or migrat\* or emigrat\* or immigrat\*).ti,ab.
12. ((workplace or work place or job? or career? or employment) adj3 (transfer\* or chang\* or shift\* or swop\* or swap\* or interchange\* or switch\* or shuffl\*)).ti,ab.
13. brain drain.ti,ab.
14. human resources.ti,ab.
15. ((health\* or medical or hospital or primary care) adj6 (manpower or man power or workforce or work force or staff\*)).ti,ab.
16. ((distribut\* or retain\* or retention or recruit\* or remain\*) adj6 (manpower or man power or workforce or work force or employee? or staff\* or worker? or laborer? or labourer? or personnel)).ti,ab.

17. or/1-16
18. Private Sector/
19. exp Hospitals, Private/
20. Private Practice/
21. private.ti,ab.
22. or/18-21
23. Public Sector/
24. exp Hospitals, Public/
25. State Medicine/
26. public.ti,ab.
27. or/23-26
28. 22 or 27
29. Developing Countries.sh,kf.
30. (Africa or Asia or Caribbean or West Indies or South America or Latin America or Central America).hw,kf,ti,ab,cp.
31. (Afghanistan or Albania or Algeria or Angola or Antigua or Barbuda or Argentina or Armenia or Armenian or Aruba or Azerbaijan or Bahrain or Bangladesh or Barbados or Benin or Byelarus or Byelorussian or Belarus or Belorussian or Belorussia or Belize or Bhutan or Bolivia or Bosnia or Herzegovina or Hercegovina or Botswana or Brazil or Brasil or Bulgaria or Burkina Faso or Burkina Fasso or Upper Volta or Burundi or Urundi or Cambodia or Khmer Republic or Kampuchea or Cameroon or Camerons or Cameron or Camerons or Cape Verde or Central African Republic or Chad or Chile or China or Colombia or Comoros or Comoro Islands or Comores or Mayotte or Congo or Zaire or Costa Rica or Cote d'Ivoire or Ivory Coast or Croatia or Cuba or Cyprus or Czechoslovakia or Czech Republic or Slovakia or Slovak Republic or Djibouti or French Somaliland or Dominica or Dominican Republic or East Timor or East Timur or Timor Leste or Ecuador or Egypt or United Arab Republic or El Salvador or Eritrea or Estonia or Ethiopia or Fiji or Gabon or Gabonese Republic or Gambia or Gaza or Georgia Republic or Georgian Republic or Ghana or Gold Coast or Greece or Grenada or Guatemala or Guinea or Guam or Guiana or Guyana or Haiti or Honduras or Hungary or India or Maldives or Indonesia or Iran or Iraq or Isle of Man or Jamaica or Jordan or Kazakhstan or Kazakh or Kenya or Kiribati or Korea or Kosovo or Kyrgyzstan or Kirghizia or Kyrgyz Republic or Kirghiz or Kirgizstan or Lao PDR or Laos or Latvia or Lebanon or Lesotho or Basutoland or Liberia or Libya or Lithuania or Macedonia or Madagascar or Malagasy Republic or Malaysia or Malaya or Malay or Sabah or Sarawak or Malawi or Nyasaland or Mali or Malta or Marshall Islands or Mauritania or Mauritius or Agalega Islands or Mexico or Micronesia or Middle East or Moldova or Moldovia or Moldovian or Mongolia or Montenegro or Morocco or Ifni or Mozambique or Myanmar or Myanma or Burma or Namibia or Nepal or Netherlands Antilles or New Caledonia or Nicaragua or Niger or Nigeria or Northern Mariana Islands or Oman or Muscat or Pakistan or Palau or Palestine or Panama or Paraguay or Peru or Philippines or Philipines or Phillipines or Phillippines or Poland or Portugal or Puerto Rico or Romania or Rumania or Roumania or Russia or Russian or Rwanda or Ruanda or Saint Kitts or St Kitts or Nevis or Saint Lucia or St Lucia or Saint Vincent or St Vincent or Grenadines or Samoa or Samoan Islands or Navigator Island or Navigator Islands or Sao Tome or Saudi Arabia or Senegal or Serbia or Montenegro or Seychelles or Sierra Leone or Slovenia or Sri Lanka or Ceylon or Solomon Islands or Somalia or Sudan or Suriname or Surinam or Swaziland or Syria or Tajikistan or Tadjhikistan or Tadjikistan or Tadjhik or Tanzania or Thailand or Togo or Togolese Republic or Tonga or Trinidad or Tobago or Tunisia or Turkey or Turkmenistan or Turkmen or Uganda or Ukraine or Uruguay or USSR or Soviet Union or Union of Soviet Socialist Republics or Uzbekistan or Uzbek or Vanuatu or New Hebrides or Venezuela or Vietnam or Viet Nam or West Bank or Yemen or Yugoslavia or Zambia or Zimbabwe or Rhodesia).hw,kf,ti,ab,cp.
32. ((developing or less\* developed or under developed or underdeveloped or middle income or low\* income or underserved or under served or deprived or poor\*) adj (countr\* or nation? or population? or world)).ti,ab.
33. ((developing or less\* developed or under developed or underdeveloped or middle income or low\* income) adj (economy or economies)).ti,ab.
34. (low\* adj (gdp or gnp or gross domestic or gross national)).ti,ab.
35. (low adj3 middle adj3 countr\*).ti,ab.
36. (lmic or Imics or third world or lami countr\*).ti,ab.
37. transitional countr\*.ti,ab.
38. or/29-37
39. randomized controlled trial.pt.
40. controlled clinical trial.pt.
41. multicenter study.pt.
42. random\*.ti,ab.
43. trial.ti,ab.

Interventions for managing the movement of health workers between public and private organizations in low- and middl...

44. ((multicenter or multicentre or multi center or multi centre) adj study).ti,ab.

45. intervention\*.ti,ab.

46. control\*.ti,ab.

47. evaluat\*.ti,ab.

48. effect?.ti,ab.

49. impact?.ti,ab.

50. (time series or time points).ti,ab.

51. (quasi experiment\* or quasiexperiment\*).ti,ab.

52. or/39-51

53. Animals/

54. Humans/

55. 53 not (53 and 54)

56. 52 not 55

57. 17 and 28 and 38 and 56

58. "comment on".cm.

59. (systematic review or literature review).ti.

60. (editorial or comment or meta-analysis or news or review).pt.

61. "cochrane database of systematic reviews".jn.

62. or/58-61

63. 57 not 62

### 3 EMBASE Ovid search strategy

1. migration/

2. population dynamics/

3. Residential Mobility/

4. career mobility/

5. Employment/

6. employment status/

7. parttime employment/

8. self employment/

9. temporary employment/

10. workplace/

11. personnel/

12. personnel shortage/

13. manpower/

14. manpower planning/

15. Personnel turnover/

16. (transfer\* or movement\* or move\* or moving or migrat\* or emigrat\* or immigrat\*).ti,ab.

17. ((workplace or work place or job? or career? or employment or vocation?) adj3 (transfer\* or chang\* or shift\* or swop\* or swap\* or interchang\* or switch\* or shuffl\*).ti,ab.

18. brain drain.ti,ab.

19. human resources.ti,ab.

20. ((health\* or medical or hospital? or primary care) adj6 (manpower or man power or workforce or work force or staff)).ti,ab.

21. ((distribut\* or retain\* or retention or recruit\* or remain\*) adj6 (manpower or man power or workforce or work force or employee? or staff\* or worker? or laborer? or labourer? or personnel)).ti,ab.

22. or/1-21

23. "organization and management"/

24. private hospital/

25. private practice/
26. private.ti,ab.
27. or/23-26
28. public hospital/
29. national health service/
30. public.ti,ab.
31. "organization and management"/
32. or/28-31
33. 27 or 32
34. Developing Country.sh.
35. (Africa or Asia or Caribbean or West Indies or South America or Latin America or Central America).hw,ti,ab,cp.
36. (Afghanistan or Albania or Algeria or Angola or Antigua or Barbuda or Argentina or Armenia or Armenian or Aruba or Azerbaijan or Bahrain or Bangladesh or Barbados or Benin or Byelarus or Byelorussian or Belarus or Belorussian or Belorussia or Belize or Bhutan or Bolivia or Bosnia or Herzegovina or Hercegovina or Botswana or Brazil or Brasil or Bulgaria or Burkina Faso or Burkina Fasso or Upper Volta or Burundi or Urundi or Cambodia or Khmer Republic or Kampuchea or Cameroon or Cameroons or Cameron or Camerons or Cape Verde or Central African Republic or Chad or Chile or China or Colombia or Comoros or Comoro Islands or Comores or Mayotte or Congo or Zaire or Costa Rica or Cote d'Ivoire or Ivory Coast or Croatia or Cuba or Cyprus or Czechoslovakia or Czech Republic or Slovakia or Slovak Republic or Djibouti or French Somaliland or Dominica or Dominican Republic or East Timor or East Timur or Timor Leste or Ecuador or Egypt or United Arab Republic or El Salvador or Eritrea or Estonia or Ethiopia or Fiji or Gabon or Gabonese Republic or Gambia or Gaza or Georgia Republic or Georgian Republic or Ghana or Gold Coast or Greece or Grenada or Guatemala or Guinea or Guam or Guiana or Guyana or Haiti or Honduras or Hungary or India or Maldives or Indonesia or Iran or Iraq or Isle of Man or Jamaica or Jordan or Kazakhstan or Kazakh or Kenya or Kiribati or Korea or Kosovo or Kyrgyzstan or Kirghizia or Kyrgyz Republic or Kirghiz or Kirgizstan or Lao PDR or Laos or Latvia or Lebanon or Lesotho or Basutoland or Liberia or Libya or Lithuania or Macedonia or Madagascar or Malagasy Republic or Malaysia or Malaya or Malay or Sabah or Sarawak or Malawi or Nyasaland or Mali or Malta or Marshall Islands or Mauritania or Mauritius or Agalega Islands or Mexico or Micronesia or Middle East or Moldova or Moldovia or Moldovan or Mongolia or Montenegro or Morocco or Ifni or Mozambique or Myanmar or Myanma or Burma or Namibia or Nepal or Netherlands Antilles or New Caledonia or Nicaragua or Niger or Nigeria or Northern Mariana Islands or Oman or Muscat or Pakistan or Palau or Palestine or Panama or Paraguay or Peru or Philippines or Philipines or Phillipines or Phillippines or Poland or Portugal or Puerto Rico or Romania or Rumania or Roumania or Russia or Russian or Rwanda or Ruanda or Saint Kitts or St Kitts or Nevis or Saint Lucia or St Lucia or Saint Vincent or St Vincent or Grenadines or Samoa or Samoan Islands or Navigator Island or Navigator Islands or Sao Tome or Saudi Arabia or Senegal or Serbia or Montenegro or Seychelles or Sierra Leone or Slovenia or Sri Lanka or Ceylon or Solomon Islands or Somalia or Sudan or Suriname or Surinam or Swaziland or Syria or Tajikistan or Tadjikistan or Tadjikistan or Tadjhik or Tanzania or Thailand or Togo or Togolese Republic or Tonga or Trinidad or Tobago or Tunisia or Turkey or Turkmenistan or Turkmen or Uganda or Ukraine or Uruguay or USSR or Soviet Union or Union of Soviet Socialist Republics or Uzbekistan or Uzbek or Vanuatu or New Hebrides or Venezuela or Vietnam or Viet Nam or West Bank or Yemen or Yugoslavia or Zambia or Zimbabwe or Rhodesia).hw,ti,ab,cp.
37. ((developing or less\* developed or under developed or underdeveloped or middle income or low\* income or underserved or under served or deprived or poor\*) adj (countr\* or nation? or population? or world)).ti,ab.
38. ((developing or less\* developed or under developed or underdeveloped or middle income or low\* income) adj (economy or economies)).ti,ab.
39. (low\* adj (gdp or gnp or gross domestic or gross national)).ti,ab.
40. (low adj3 middle adj3 countr\*).ti,ab.
41. (Imic or Imics or third world or lami countr\*).ti,ab.
42. transitional countr\*.ti,ab.
43. or/34-42
44. Randomized controlled trial/
45. Time Series Analysis/
46. (randomised or randomized).tw.
47. experiment\$.tw.
48. (time adj series).tw.
49. (pre test or pretest or post test or posttest).tw.
50. impact.tw.
51. intervention?.tw.

52. chang\$.tw.
53. evaluat\$.tw.
54. effect?.tw.
55. compar\$.tw.
56. or/44-55
57. nonhuman/
58. 56 not 57
59. 22 and 33 and 43 and 58
60. (systematic review or literature review).ti.
61. (editorial or comment or meta-analysis or news or review).pt.
62. "cochrane database of systematic reviews".jn.
63. or/60-62
64. 59 not 63

#### 4 LILACS search strategy

("emigration and immigration" or "population and dynamics" or "residential and mobility" or "transients and migrants" or "career and choice" or "employment" or "workplace" or "personnel and selection" or "personnel and staffing and scheduling" or "personnel and turnover") or (transfer\$ or movement\$ or move or moving or migrat\$ or emigrat\$ or immigrat\$) or ((workplace or "work and place" or job\$ or career\$ or employment) AND (transfer\$ or chang\$ or shift\$ or swop\$ or swap\$ or interchange\$ or switch\$ or shuffl\$)) or ("brain and drain" or "human and resources") or ((health\$ or medical or hospital or "primary and care") AND (manpower or "man and power" or workforce or "work and force" or staff\$)) or ((distribut\$ or retain\$ or retention or recruit\$ or remain\$) AND (manpower or "man and power" or workforce or "work and force" or employee\$ or staff\$ or worker\$ or laborer\$ or labourer\$ or personnel)) AND ("private and sector" or "hospitals, private" or "private and practice" or private)

#### 5 British Nursing Index Ovid search strategy

1. "Staff : Recruitment and Turnover"/
2. "Careers and Career Planning"/
3. "Employment and Unemployment"/
4. staff : welfare/
5. "Staff : Conditions of Service"/
6. "Staff : Job Satisfaction"/
7. (transfer\* or movement\* or move\* or moving or migrat\* or emigrat\* or immigrat\*).ti,ab.
8. ((workplace or work place or job? or career? or employment or vocation?) adj3 (transfer\* or chang\* or shift\* or swop\* or swap\* or interchang\* or switch\* or shuffl\*)).ti,ab.
9. brain drain.ti,ab.
10. human resources.ti,ab.
11. ((health\* or medical or hospital? or primary care) adj6 (manpower or man power or workforce or work force or staff\*)).ti,ab.
12. ((distribut\* or retain\* or retention or recruit\* or remain\*) adj6 (manpower or man power or workforce or work force or employee? or staff\* or worker? or laborer? or labourer? or personnel)).ti,ab.
13. or/1-12
14. Private Health Care/
15. "General Practice and Hospitals"/
16. 14 or 15
17. developing countries.sh,ti,ab.
18. (Africa or Asia or Caribbean or "West Indies" or "South America" or "Latin America" or "Central America").ti,ab,sh.
19. (Afghanistan or Albania or Algeria or Angola or Antigua or Barbuda or Argentina or Armenia or Armenian or Aruba or Azerbaijan or Bahrain or Bangladesh or Barbados or Benin or Byelarus or Byelorussian or Belarus or Belorussian or Belorussia or Belize or Bhutan or Bolivia or Bosnia or Herzegovina or Hercegovina or Botswana or Brazil or Bulgaria or Burkina Faso or Burkina Fasso or Upper Volta or Burundi or Urundi or Cambodia or Khmer Republic or Kampuchea or Cameroon or Cameroons or Cameron or Camerons or Cape Verde or Central African Republic or Chad or Chile or China or Colombia or Comoros or Comoro Islands or Comores or Mayotte or Congo or Zaire or Costa Rica or Cote d'Ivoire or Ivory Coast or Croatia or Cuba or Cyprus or Czechoslovakia or Czech Republic or Slovakia or Slovak Republic or Djibouti or

French Somaliland or Dominica or Dominican Republic or East Timor or East Timur or Timor Leste or Ecuador or Egypt or United Arab Republic or El Salvador or Eritrea or Estonia or Ethiopia or Fiji or Gabon or Gabonese Republic or Gambia or Gaza or Georgia Republic or Georgian Republic or Ghana or Gold Coast or Greece or Grenada or Guatemala or Guinea or Guam or Guiana or Guyana or Haiti or Honduras or Hungary or India or Maldives or Indonesia or Iran or Iraq or Isle of Man or Jamaica or Jordan or Kazakhstan or Kazakh or Kenya or Kiribati or Korea or Kosovo or Kyrgyzstan or Kirghizia or Kyrgyz Republic or Kirghiz or Kirgizstan or Lao PDR or Laos or Latvia or Lebanon or Lesotho or Basutoland or Liberia or Libya or Lithuania or Macedonia or Madagascar or Malagasy Republic or Malaysia or Malaya or Malay or Sabah or Sarawak or Malawi or Nyasaland or Mali or Malta or Marshall Islands or Mauritania or Mauritius or Agalega Islands or Mexico or Micronesia or Middle East or Moldova or Moldavia or Moldovan or Mongolia or Montenegro or Morocco or Ifni or Mozambique or Myanmar or Myanma or Burma or Namibia or Nepal or Netherlands Antilles or New Caledonia or Nicaragua or Niger or Nigeria or Northern Mariana Islands or Oman or Muscat or Pakistan or Palau or Palestine or Panama or Paraguay or Peru or Philippines or Philipines or Phillipines or Phillippines or Poland or Portugal or Puerto Rico or Romania or Rumania or Roumania or Russia or Russian or Rwanda or Ruanda or Saint Kitts or St Kitts or Nevis or Saint Lucia or St Lucia or Saint Vincent or St Vincent or Grenadines or Samoa or Samoan Islands or Navigator Island or Navigator Islands or Sao Tome or Saudi Arabia or Senegal or Serbia or Montenegro or Seychelles or Sierra Leone or Slovenia or Sri Lanka or Ceylon or Solomon Islands or Somalia or Sudan or Suriname or Surinam or Swaziland or Syria or Tajikistan or Tadjhikistan or Tadjikistan or Tadjhik or Tanzania or Thailand or Togo or Togolese Republic or Tonga or Trinidad or Tobago or Tunisia or Turkey or Turkmenistan or Turkmen or Uganda or Ukraine or Uruguay or USSR or Soviet Union or Union of Soviet Socialist Republics or Uzbekistan or Uzbek or Vanuatu or New Hebrides or Venezuela or Vietnam or Viet Nam or West Bank or Yemen or Yugoslavia or Zambia or Zimbabwe or Rhodesia).ti,ab,sh.

20. ((developing or less\* developed or "under developed" or underdeveloped or "middle income" or low\* income or underserved or "under served" or deprived or poor\*) adj (countr\* or nation\* or population\* or world)).ti,ab.

21. ((developing or less\* developed or "under developed" or underdeveloped or "middle income" or low\* income) adj (economy or economies)).ti,ab.

22. (low\* adj (gdp or gnp or "gross domestic" or "gross national")).ti,ab.

23. (low adj3 middle adj3 countr\*).ti,ab.

24. (Imic or Imics or third world or lami countr\*).ti,ab.

25. transitional countr\*.ti,ab.

26. or/17-25

27. randomized controlled trial.ti,ab,sh,hw.

28. controlled clinical trial.ti,ab,sh,hw.

29. ((multicenter or multicentre or multi center or multi centre) adj study).ti,ab,sh,hw.

30. random\*.ti,ab.

31. trial.ti,ab.

32. intervention\*.ti,ab.

33. control\*.ti,ab.

34. evaluat\*.ti,ab.

35. effect\*.ti,ab.

36. impact\*.ti,ab.

37. (time series or time points).ti,ab.

38. (quasi experiment\* or quasiexperiment\*).ti,ab.

39. or/27-38

40. 13 and 16 and 26 and 39

41. 13 and 16 and 39

42. 13 and 26 and 39

43. or/40-42

## Graphs