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THE IMPACT OF USER FEES ON HEALTH IN LOW AND MIDDLE COUNTRIES: A SYSTEMATIC REVIEW

Vicky Mengqi Qin[1], Thomas Hone[2], John Ta-yu Lee[1]

1. Saw Swee Hock School of Public Health, National University of Singapore
2. School of Public Health, Imperial College London

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ABSTRACT

More than two billion people in low and middle-income countries (LMICs) are facing the challenges of accessing and affording good health care services. The risk of unbalance health expenditure between counterparts can be mitigated by the sharing of user fees. Despite the wide application of user fees in LMICs, its impact on population health persists to be highly controversial and only a few robust evidences exist. We aimed to assess the impact of user fees on health in LMICs by systematically reviewing studies done on topic.

We conducted a comprehensive literature search for six databases and reference lists of the eligible studies. Study selection was based on PICOS (population, intervention, comparator, outcome and study design) inclusion and exclusion criteria. Two independent researchers performed risk of bias assessment using ROBINS-I tool for quasi-experimental study and Cochrane Risk of Bias Tool for randomized control trial (RCT). We also synthesized data for further analysis.

Reducing user fees had improved health at different levels. The impact of increasing user fees remained uncertain given inadequate evidence. Eleven out of thirteen studies showed impact on secondary outcomes including access and utilization of health services and financial protection. These secondary outcomes were thought to be a pathway through which user fees had influence on health.

Key words: User fees, Low and middle-income country, Health outcome

INTRODUCTION

User fees in Low and Middle Income Countries (LMICs) have become a central focus of global development, as highlighted by the United Nations Sustainable Development Goals (SDGs). User fees refers to out-of-pocket payment and the total costs borne by the patients. User fees is important for raising funding for health system, for improving financial protection among patients, and for improving health. In line with the SDGs many LMICs have committed to reducing user fees to achieve universal health coverage (UHC).

There are many studies trying to evaluate the effect of health insurance on health outcomes, but relatively few studies are able to disentangle the effect of user fees change on health outcomes.[1] While population health was obtained from a mutual function of multiple factors, evaluating the effect of user fees policy requires a rigorous design to disentangle the effects of the policy from other confounding factors in an observational study.[2 3] Endogenous bias can occur when there is self-selection variables omitted in statistical models. For example, people who are expected to use more health resources in the future may choose insurance plans that have a lower level of patient user fees.[4 5] Omitting of variable was commonly seen in studies using cross-sectional data where researchers may not have all the variables that were related to the outcome measures.

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RCT is the golden standard for evaluating health intervention, but it has some limitations to be implemented in real-world health policy interventions. Instead, some researches have adopted the quasi-experimental study (also known as natural experiment study) to improve causal inference of the policy impact. In a quasi-experimental study, the treatment group faces a change in their cost-sharing arrangement at the point of intervention while the control group does not.

QE provides more reliable measures of effect in the real-world setting[6] when RCTs are not feasible. The effect of the policy can be evaluated using longitudinal data with observations before and after

the policy, and statistical models based on a pre-post comparison with a comparable control group.There are several basic types of user fees including copayments, coinsurance, deductibles and out-of-pocket expenditure. There is not much consensus with regards to its impact on health outcomes under different health systems.[7 8] Some 1studies have examined the impact of applying user fees, however, there has not been a synthesis of what has been found. Our systematic review aims to synthesize recent evidences to assess the impact of user fees on health outcomes.

METHODS

Scope of the review

User fees in this review were defined as direct payments by subjects at the point of health services which excluded any prepayments for health services such as insurance premiums or contributions or reimbursements.[9] There were four types of frequently used user fees: co-insurance, copayment, deductible and out-of-pocket.

Search strategy

We searched for six databases (Medline, Econlit, Scopus, Jstor, World Health Organization Library Database (WHOLIS), World Bank e-library) between September and November 2016. We restricted to all English written papers (peer-reviewed articles, working paper, conference paper) published during January 1, 1990 and November 30, 2016. An additional literature search was also carried out by appraising references lists of the studies identified for this review. Studies that were not published (e.g. under review or forthcoming after 30 November 2016) were not eligible to be included.

Our review consists of three key domains: intervention (user fees), outcome (health outcome) and population (low and middle-income countries). Since we included all types of health outcomes, the search was based on the combination of synonyms for "user fees" and "LMICs":

- User fees: "reimbursement", "copayment", "co-payment", "cost sharing", "cost-sharing", "coinsurance", "co-insurance", "deductible", "user charge", "user fee", "out-of-pocket", "health insurance", "medical insurance", and Mesh: "cost sharing".
- LMICs: "Low and middle income country", "Asia", "South East Asia", "Central Asia", "sub-Saharan", "Africa", "South America", "Latin", "low-income country", "middle-income country", "developing country", "under developed", "province", Mesh: "developing country" and a list of low and middle income countries as defined by World Bank)[10].

More detail of the keyword search is available in the supplementary document. Studies were eligible for identification only if they contained at least one key word each from these two domains. Endnote X7 was used to store and manage all results from the database search.

Inclusion and exclusion criteria

Our inclusion and exclusion criteria followed Population, Interventions, Comparator, Outcomes and Study design (PICOS) framework. Studies were eligible for screening only if they met both the inclusion and exclusion criteria. Since we aimed to assess the impact of user fees on health, included studies must mention the change in direction or magnitude of user fees. Therefore, we excluded studies that simply looked at impact of health insurance without mentioning changes in user fees. Only quasi-experimental studies and randomized control trials were included. To ensure the changes in health outcomes can be attributed to user fees, we also excluded quasi experimental studies that examined complex interventions.

<Insert table 1>

Data Extraction

After removing duplicate studies, the remaining studies were first screened by title and abstract, and then subsequently by full text screening for the selected study by one reviewer (VMQ). This reviewer excluded all irrelevant studies by title and abstract and this was double checked by the second reviewer (JTL). Both reviewers (VMQ & JTL) then discussed the discrepancies and came to a consensus on the inclusion of selected studies. Data was extracted from the selected studies including author, year of publication, interventions, country of study, user fees change, study population, study design, primary outcomes and secondary outcomes if any.

Risk of Bias Assessment

Risk of bias was assessed using ROBINS-I tool (Risk Of Bias in Non-randomized Studies- of Interventions) for quasi-experimental design and Cochrane Risk of Bias Tool for RCTs by two

independent reviewers (VMQ and JTL).

The ROBINS-I assessed seven domains of methodological quality: bias due to confounding; bias in selection of participants into the studies; bias in classification of interventions; bias due to deviation from intended intervention, bias due to missing data; bias in measurement of outcomes and bias in selection of the reported result. Each domain can be graded as low risk, moderate risk, critical risk of bias or no information based on corresponding signaling questions. Overall risk of bias (low/moderate/serious/critical/no information) were made based on judgements of domains.

The Cochrane Risk of Bias Tool assessed methodological quality in the following domains: Selection bias in random sequence generation; Selection bias in allocation concealment; Reporting bias due to selective reporting; Performance bias in blinding of participants and personnel; Detection bias in blinding of outcome assessment; Attrition bias due to incomplete outcome data; Other bias from other sources.

Data Synthesis

Due to heterogeneity between studies with respect to measurement of health status, we conducted a systematic review for synthesis. Studies were first grouped by the selected characteristics including study year, study design, user fees change, economic development measured by GDP, health outcome category, population age and social economic status of the population. Results were synthesized by the directions of user fees change.

RESULTS

Search Results and Study Characteristics

Our search found 8495 records, of which 1340 duplicates were removed. Records were screened by title and abstract, followed by full text screening. After full text screening, 300 studies were excluded due to the following reasons: irrelevant intervention (31), irrelevant outcomes (87), irrelevant study

design (111), not studies in LMICs (26) and other reasons such as unrelated study, under review or no full text available (45). Thirteen studies met the final inclusion criteria. Study selection process is elaborated in the PRISMA flow chart (in appendix).

<Insert figure 2>

Studies were from eleven LMICs: China, India, Vietnam, the Philippines, Georgia, Jamaica, Ghana, Malawi, Kenya, Senegal and South Africa, Sudan, Ghana [1 11-26] of which two were low income countries,[17 18] nine were low-middle income countries [12-14 18 20 24 25] and six were upper-middle income countries.[1 15 16 19 21-23] Majority of the papers were published after 2010 except studies by Gaviria et al. (2006)[22], Mensah et al. (2010)[12], Ansah et al. (2009)[26] and Abdu et al. (2004)[24]. Out of the thirteen studies, twelve examined reduction of user fees, [11-23] and one examined the increase of user fees. One of the selected papers by Watson et al.[17] had carried out both increase and reduction of the user fees. To evaluate the causal effect, six studies used difference-in-difference (DID), three studies used regression discontinuity (RD). Basic characteristics of the included studies are summarized in table 2 in appendix.

<Insert table 2>

Two studies were rated as low risk of bias, six studies were rated as moderate risk and two studies rated serious overall risk of bias judgement using the ROBIN-I tool. For domain-level risk of bias, the most common pitfalls in causality for quasi-experimental studies are bias due to confounding and classification of intervention. For example, studies from Malawi[17], Georgia[19] were rated serious risk of confounding as there was at least one known important domain that was not appropriately measured, or controlled for, or the measurement of an important domain was low. [27]

<insert table 3>

We categorized user fees change as increasing and reducing user fees. Increasing user fees refers to subjects who pay more after the policy implementation whereas reducing user fees referred to subjects

who pay less after policy implementation.

All types of health outcome were included in this review. It can entail any indicators from but not limited to mortality, self-reported health status, infectious diseases and the like.

Findings from Increasing User Fees

Increasing user fees consisted of both introduction and increase of user fees. Only two studies examined the effect of increasing user fees, [1 17] of which one study from Malawi, assessed introduction of user fees and one study from China, assessed increase of user fees. One study found significant effect on lowering infectious disease diagnosis and the other did not show significant effect on self-reported health status.

In Malawi, user fees for general outpatient visits were introduced in July 2013 after almost five-decades of free public health care since September 1964. Using DID study design, Watson et al.[17] showed that introducing user fees substantially reduced the diagnosis of new HIV cases by 48% for age 15-49 years and of new malaria cases by 18% for age under 5 years and 56% for age above 5 years. This study limited itself in generalizing the results nationally because data was collected only in one district and health seeking behavior of patients in terms of user fees was difficult to determine. It was possible that patients sought care outside of the district because the user fees were introduced. Therefore, this study was rated serious in confounding and selection bias by ROBIN-I tool.

China launched the Urban Employee Basic Medical Insurance (UEBMI) reform in 1998. Before the reform, outpatient user fees was about 30%~40% of outpatient medical expenditures. These user fees increased to 86% in 2006 after reform. In addition, inpatient user fees modestly increased from 20% to 28% in 2006. Huang et al. [1] found that health outcomes as measured by self-reported status was not significantly affected by the higher user fees using DID study design. Subgroup analysis suggested that the elderly was more sensitive while high-income group was less sensitive to price change. In general, UEBMI reform was effective by mitigating overuse of health services to some

extent. However, since the follow-up time was relatively short, this study was not able to show a long-term health consequences. In general, this study with moderate risk of bias was the first to investigate increase of user fees in UEBMI on health.

<insert table 5>

Findings from Reducing User Fees

Reducing user fees entailed both abolition and reduction of fees. One study from Sudan examined isolated reduction of user fees on health. Twelve studies (Vietnam, India, South Africa, Jamaica, Malawi, Kenya, Senegal, Georgia, Ghana, Philippines)[11 13-18 20 25 26] examined the abolition of user fees.

Three studies [14 18 26] examined mortality and two of them[13 18] found a significant reduction in the mortality rate. One study [18] rated moderate risk of bias from sub-Saharan Africa examined removal of user fees for facility-based delivery in Ghana (2003), Kenya (2007) and Senegal (2005) comparing against Cameroon, Congo, Ethiopia, Gabon, Mozambique, Nigeria and Tanzania where the user fees policies remained. With a DID study design, Mckinnon [18] found that removing user fees have reduced neonatal mortality rates by 9%. However, there was a concern that policies on user fees change in these three countries were not identical. A RCT from Ghana did not find significant difference on mortality. Ansah et al. [26] indicated that there may be more important costs such as opportunity cost apart from direct cost that influenced health outcome.

Five studies [11 14 16 19 20] examined self-reported health status and three of them found significant improvement whereas Bauhoff et al. [19] and Guindon [20] found no significant change in health as measured by activities of daily living and number of sickness days and bed days, respectively. One study from Vietnam [11] rated low risk of bias examined the effect of free access to inpatient and

outpatient services in public facilities since 2005 for children younger than 6 years old from non-poor family using DID study design. Nguyen et al. found there was a desirable impact on intermediate health status such as a 26% reduction in number of sick days for children aged 4-5 years old compared with children age 6-7 years old. Although the age group 6-7 years old may not be the perfect comparator, bias due to unobserved time trend was not likely because of short time period before and after user fees change.

Five studies [14 17 24-26] examined infectious diseases, four of them found increase in diagnosis of infectious diseases which led to disease prevention. One moderate risk of bias study[14] from India assessed the impact of free tertiary care for households below the poverty line between 2010 and 2012. From a study design of RD, Sood et al. found that removing user fees for tertiary care significantly reduced risk of infection, with 9.4% reduction in occurrence of infections during hospitalization for eligible households. Results from RCTs [24 25] also reported an substantial increase in the early diagnosis of malaria with different levels of user fees exemption in Sudan and a lagged health effect of 9% reduction of CRP (the presence of an acute infection or other types of inflammation) in the Philippines.

Six studies [11 15 16 20 25 26] examined other health outcomes including nutritional improvement [15 25 26]and days lost because of illness [11 16 20]. In general, most studies suggested better health outcome after user fees abolishment.

One study from South Africa [15] with low risk of bias, examined the abolition of user fees from prenatal and postnatal care for pregnant women and all health services for children under six years of age at public facilities since June 1994. Using DID study design, Tanaka suggested a substantial short-term improved nutritional status as measured by 0.64 standard deviation (SD) increase in average weight-for-age Z-score (WAZ) for newborns, and 0.57 SD greater improvement for children who had low health status at birth from 1993 to1998. A short-term effect was also found when using

weight-for-height Z-score (WHZ) but no long-term effect was found when using height-for-age Z-score (HAZ). Gender difference in WAZ in the study area indicated that simply providing free care may not equally benefit both genders (0.97 higher for boys aged 0-3 years, 1.05 higher for 5-8 years, P<0.001).

However, an RCT from Ghana found no differences between intervention (3.2%) and control (3.1%) group of children in the prevalence of moderate anaemia. The RCT from Philippines examined nutritional effect measured by weight-height ratio suggested a lagged health effect in the post discharge period.

<insert table 6>

Findings from Secondary Outcomes

Eleven out of thirteen studies also assessed access and utilization of health services, and financial protection. Ten studies focused on access and health services utilization,[1 11 13 16-20 24 26], four studies focused on both access and utilization of health services and health expenditure, [1 11 13 19] and one study[16] focused on national productivity.

Watson et al. [17] reported that introduction of user fees in Malawi substantially reduced outpatient attendances by 68% whereas Huang et al. [1] found increase of user fees had minor reduction in outpatient and inpatient care utilization by 7% and 0.1%, respectively. Besides, increasing user fees in China reduced considerably outpatient care expenditure by 35.2% and minor reduction in inpatient care expenditure by 4.1%.

With a reduction of user fees, most studies [11 13 14 17 18] found an increase in health services utilization, except on outpatient and inpatient service utilization in Georgia,[19] and outpatient service under HCFP and inpatient admissions under the Law on Protection and Care of Children in Vietnam, [20] and caesarean delivery in Ghana, Kenya and Senegal as a pooled effect[18]. Nguyen further found an overall pattern that the reduction use of tertiary hospitals was substituted by the

increase use of secondary hospitals.[11] With different levels of user fees exemption under a randomized experiment in Sudan, health services utilization increased as the fee exemption increased for both children under 5 and pregnant women.[24]

With respect to financial protection, all four studies [1 11 13 19] found considerable reduction in health expenditure. For example, Sood et al. 2014[13] found a 12.3% greater use of tertiary care facilities and a 34% reduction in out-of-pocket health expenditure for admission to hospitals for covered conditions. In addition, it was found the increased use of tertiary care services enabled more to seek treatment for symptoms especially those associated with cardiac conditions which in turn help to reduce the risk of death[13].

DISCUSSION

Main Findings

There was a trend to reduce user fees in the selected studies in the past two decades. Our findings suggested that removing user fees in general had positive impact on health, especially on mortality reduction and infectious disease prevention, whilst increasing user fees had a negative effect on infectious disease but minor effect on self-reported health. However, evidence from increasing user fees was limited and a longer-term observation of the impact of user fees in LMICs is needed in future studies.[1 11 15 20]

Bauhoff et al.[19] and Guindon (132) did not find improvement in self-reported health after removing user fees. A few studies did not find significant change in health service utilization.[18 19] It was probable that the time frame of data collected before and after user fees change was too short to obtain significant effect. It was also likely that other factors apart from user fees could have influenced health utilization. Fortunately, despite the user fees change in both direction, there still was a financial protection for the patients.

A number of studies indicated that there was a mechanism through which user fees affected health by change in health service utilization.[11 13 15 17] By enhancing financial protection for health in LMICs, it is hoped that this influences health seeking behavior which can in turn improve health and health expenditure.[28] Literature indicated that more affordable health services as well as increased utilization as part of UHC shows that it improves population health outcomes[29], but this may also raise another concern about Moral hazard. Many LMICs in this review were trying to reduce patients' financial burden of seeking health care by reducing or removing user fees. Nonetheless, reducing user fees may not always improve health if the quality of care supply cannot meet the increase in demand of utilization.[30] Over-utilizing health service has been a concern in China [31] and therefore the magnitude of user fees change matters as in the case of UEBMI (Urban Employee Medical Insurance)

which led to an increase in the user fees.

We only included studies with "intervention" isolated to demand-side user fees, however, this financing mechanism can only explain part of the change in health outcomes[23 32]. It is to noted that health outcome can also be influenced by other important components included improving quality of care, upgrading facilities, hospital management and the like.[32].

Comparison

There were only a few systematic reviews trying to uncover the effect of user fees on health. Our findings were similar to a recent systematic review of the impact of user fees on maternal health service utilization and related health outcome. Susie et al.[30] found increase in maternal and perinatal deaths following introducing user fees whereas maternal mortality ratios reduced as user fees exempted in Ghana.

The impact of user fees change on health outcome was more pronounced in LMICs than high income countries. A study as old as RAND Health Insurance Experiment (HIE) conducted an RCT study to investigate the effect of user fees on health in U.S. during 1970s and 1980s. The study suggested that those who had to pay a share for health care had a lower utilization of health services compared to those who were given free care. However, user fees in general had no adverse effect on participants' health. In terms of infectious disease, hypertension and selected serious symptoms have been improved under free care.[33] From the findings of this review, the effect of user fees change on health outcome was through the change of healthcare utilization. In 2008, another famous RCT called the Oregon Health Insurance Experiment was conducted in U.S.

One study suggested that medicaid coverage under Oregon experiment significantly not only increased outpatient, hospital and emergency department utilization as well as reduced financial burden on catastrophic medical expenditure, but also improved self-reported health status by 25% and depression.[34] The influence of user fees change on utilization had a consistent pathway as

shown in HIE. On the other hand, our review showed a substantial impact of user fees on diagnosis of infectious diseases such as HIV, malaria. A decline user fees had largely reduced incidence of infectious diseases for those scheme beneficiaries.[17]

Strength and Limitation

This review was the first attempt to systematically assess the impact of user fees change on health outcome in LMICs. The strengths of this review are: our search was not limited to any specific health outcomes and therefore provided a comprehensive impact of user fees change. We only included studies with isolated demand-side intervention to obtain robust evidence of user fees impact on health even though we still agree that reducing patients' financial burden alone may not be the only factor to improve health outcomes.[12 35] For example, Wang et al.[35] suggested a significant improvement in health status for villagers after removing user fees. However, part of these effects may also be attributed to supply-side interventions such as improvement in efficiency and quality of services. Therefore, an enhanced health system as a whole including better infrastructure, governance, efficiency and quality of health service are needed.[15 28] The majority of the included studies are quasi-experimental studies. However, quasi-experimental study design provides a second best robust evidence for policy impact evaluation when RCT is difficult to carry out in real-world setting in considering of ethical issues, costs and complexity.

This review also had some limitations. Due to the large heterogeneity of health outcomes, we are unable to synthesize data using meta-analysis. Some of the papers in this review used health insurance bonded user fees change, which raised concerns on reverse causality. However, most of the health insurance bonded user fees were provided to the vulnerable, hence, we did not expect much baseline differences between the intervention and control groups. Besides, very few studies provided explicit magnitude change in user fees, thus, it was difficult to provide evidence for designing range of user fees in LMICs for policy makers. In addition, there are always unmeasured variables in real-world settings that may interact with user fees and affect health outcomes simultaneously. Since user fees

scheme has a relatively short history in many LMICs, time frame is a common limitation faced by some studies to assess long-term effect on health.

There was only one study found on the impact of increasing user fees which means our review had inadequate evidence on the impact on user fees change in such pattern. More subgroup analysis studies are expected especially subgroup analysis in future research.

Conclusion

Randomized control trials (RCT) are often difficult to use in assessing health policy impact in real life because of economic reasons and ethical consideration, especially in LMICs. Quasi-experimental study design is more feasible and affordable quantitative method to conduct in LMIC for policy impact evaluation. In real life setting there would be many risk factors influencing health change and therefore a careful study design of impact evaluation is needed.

The trend to reduce user fees had in general improved health in LMICs, especially on the reduction of mortality and prevention of infectious diseases. While many LMICs are making efforts to achieve universal health coverage by reducing user fees for health services, robust evidences of the impact of user fees on health are still lacking.

APPENDIX

Box I. What is quasi experiment study?

Quasi-experiment (also known as natural experiment) is a research design to evaluate prospectively or retrospectively the causality of an intervention (e.g. policy) on its outcome (e.g. health status). There are usually a treatment group and a control group with and without exposing to the intervention respectively for comparison purpose. Quasi experiment is an important alternative of true experiment (randomized control trial) when treatment and control are difficult to be randomly assigned.

Types of quasi-experiment method

Propensity Score Matching (PSM): The effect of the intervention using PSM is captured by the average difference between the matching treatment group and the control group with similar observable characteristics which are measured by propensity score.

Regression Discontinuity (RD): A cut-off point for indicator of interest is created to allocate the intervention and control group. Both groups lie closely on either side of the cut-off point. The average effect comes from the comparison between outcome of the treated and controlled.

Difference-in-Difference (DID): The effect of the intervention using DID estimator is captured by the outcome change (pre-policy to post-policy) in treatment group, minus the outcome change in control group.

Instrumental variable (IV): If there is a correlation between explanatory variable X and error term u, an instrumental variable can be used to isolate the part of X that is uncorrelated with u and estimate the regression coefficients of X on dependent variable Y.

Interrupted Time Series (ITS): ITS collects repeated observations from multiple time points before and after an intervention (an "interruption") to measure the change of outcome of interest. ITS is useful when the outcome of interest changes over time regardless of the intervention or there are multiple factors influencing the outcome variable.

Box II. What is Universal Health Coverage?

Universal Health Coverage (UHC) is a mechanism to ensure everyone in a community or country receives good quality health care services they need without suffering from financial hardship. Accessibility and affordability are two key characteristics of health care services to be covered universally.

Countries at different development stages need different interventions and cost-sharing methods. **What to cover?** The coverage should address the most important causes of diseases and mortality with health care services of good quality on the service recipients. **How to finance?** Based on the economic development and finance system of a community or country, an appropriate cost-sharing structure should be applied such as deductible, coinsurance, out-of-pocket, copayment etc. in the health care service payment system. **Who is insured?**

Any country cannot provide all services for everyone free of charge sustainably, but UHC should expand the coverage of health care services and enhance financial protection progressively. Helping people get access to affordable health care services is also a way to achieve equity, development priorities, social inclusion and cohesion. (WHO)

What is user fees in developing world (also known as cost sharing)?

User fees in health care refers to the cost of health care service paid by service consumer (patient). There are several types of user fees based on the payment method used in developing countries:

Copayment: Copayment is a payment settled by flat amount that a person has to pay for the service received.

Coinsurance: Coinsurance is a payment settled by portion that a person has to pay for the service received.

Deductible: Deductible is the fixed amount a person pays before the cost-sharing plan (e.g. health insurance) pays anything.

Out-of-pocket: Out-of-pocket refers to direct payments to the health service provider at the time of service use until the payments reach the limit that the user fees plan will compensate for the rest of the cost.

Table 1. Inclusion and exclusion criteria for study selection

Selection criteria	Inclusion criteria	Exclusion criteria
Population	Individuals or communities or countries in LMICs	Individuals or communities or countries in non-LMICs
Intervention	Isolated demand-side user fees change attributed to financing policy or health insurance scheme for health services, including increase, decrease, introduction and abolition of user fees. The study could either mention direction or magnitude changes in amount or proportion of user fees	Complex intervention (consisted both demand-side and supply side intervention); Studies that examined the impact of health insurance without explicitly mentioned changes in user fees;
Comparator	Individuals or communities or countries in LMICs that did not expose to user fees change during the period of study;	None
Outcome	Health outcomes evaluated by physiologic outcomes, such as weight-for-height, or self-reported health status, such as self-reported day lost because of illness, or event occurrence, such as morbidity (infectious or communicable disease) and mortality	None
Study design	Quasi-experimental study design: difference-in-difference (DID), propensity score matching (PSM), instrumental variable (IV), regression discontinuity, interrupted time series (ITS) and any combination of these designs	Randomized control trial (RCT), cluster-randomized control trial (CRT), cross-sectional study, qualitative study, cost benefit analysis (CBA), case report, systematic review

Table 2. Basic characteristics of the selected literatures

Characteristic	Asia	America	Africa	Europe	Total
Study published year					
1990-2000	0	0	0	0	0
2001-2010	0	1	2	0	3
2011-2016	6	1	3	1	11
Study design					
DID	3	1	3	0	7
RD	2	0	0	1	3
PSM	0	0	0	0	0
IV	0	0	0	0	0
RCT	1	0	2	0	3
User fees change					
Increase	1	0	1	0	1
Reduce	4	4	4	1	12
Economy					
Upper middle income	1	1	1	1	6
Lower middle income	2	3	3	0	4
Low income	0	0	1	0	1
Health outcome category					
Self-reported health status	4	1	0	1	6
Infectious disease	2	0	3	0	5

Mortality	1	0	2	0	3
Others	3	1	2	0	6
Target population age					
Infant & Children	2	2	2	0	6
Adults	0	1	1	0	2
Elderly	0	0	0	0	0
Overall	3	1	1	1	6
Social economic status					
Poor	3	1	0	1	5
Non-poor	3	1	3	0	7

DID= difference-in-difference; RD= regression discontinuity; PSM= propensity score matching; IV= instrumental variable

Health outcome category: Communicable disease refers to HIV, malaria and other infectious disease; General health refers to self-reported health status, weight-for-age, weight-for-height, Activities of Daily Living (ADL), number of sick days, low birth weight; Mortality includes both neonatal and adults. The sum of Economy, Health outcome category may not add up to 14 because some studies evaluated more than one country and type of health outcome. America in this review included both North, South and Latin America.

Table 3-1. Risk of bias assessment for quasi-experimental studies

	Pre-intervention		At-intervention	Post-intervention				Overall judgement
Study	Confounding	selection bias	misclassification	deviation from intended intervention	missing data	measurement of outcomes	selection of reported results	
Watson et al. 2016	Serious	Serious	Moderate	Moderate	NI	Low	Serious	Serious
Nguyen et al. 2012	Low	Moderate	Moderate	Low	Low	Moderate	Low	Low
Sood et al. 2014	Moderate	Moderate	Moderate	Serious	Moderate	Moderate	Moderate	Moderate
Tanaka, 2014	Moderate	Moderate	Moderate	Low	NI	Moderate	Moderate	Low
Sood et al. 2015	Moderate	Moderate	Moderate	Low	Moderate	Moderate	Moderate	Moderate
Beuermann et al. 2016	Serious	Moderate	Moderate	Low	Low	Moderate	Serious	Moderate
McKinnon et al., 2015	Moderate	Serious	Serious	NI	Moderate	Moderate	Low	Moderate
Bauhoff et al., 2011	Moderate	Moderate	Moderate	Moderate	Low	Moderate	Moderate	Moderate
Guindon 2014	Moderate	Moderate	Serious	Low	Low	Moderate	Moderate	Serious
Huang et al.	Moderate	Moderate	Serious	Low	Moderate	Moderate	Moderate	Moderate

2015								

*Low: low risk of bias; Moderate: Moderate risk of bias; Serious: Serious risk of bias; Critical: Critical risk of bias; NI: No information

Table 3-2. Risk of bias assessment for randomized control trial

Study	selection bias		reporting bias	Other bias	Performance bias	Detection bias	Attrition bias
	Random sequence generation	Allocation concealment	Selective reporting		Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data
Abdu et al. 2004	Low	Low	Unclear	Low	Low	Unclear	Low
Ansah et al. 2009	Low	Low	High	Unclear	High	High	Low
Quimbo et al. 2011	Low	Low	Unclear	Unclear	Low	Unclear	Low

Table 4. Direction or magnitude change in user fees

Study (country)	Policy scale	Direction of change	Before	After
Watson et al. 2016 (Malawi)	District	Introduce	Free public health care	User fees introduced
Nguyen et al. 2012 (Vietnam)	Country	Remove	User fees in the public hospitals were major financial burden	All user fees abolished

Sood et al. 2014 (India)	District	Remove	Pre-policy fees unspecified	All user fees abolished
Tanaka, 2014 (South Africa)	Country	Remove	Pre-policy fees unspecified	All user fees abolished
Sood et al. 2015 (India)	District	Remove	Pre-policy fees unspecified	All user fees abolished
Beuermann et al. 2016 (Jamaica)	Country	Remove	Pre-policy fees unspecified	All user fees abolished
Watson et al. 2016 (Malawi)	District	Remove	Pre-policy fees unspecified	All user fees abolished
McKinnon et al., 2015 (Ghana, Kenya, Senegal)	Country	Remove	Pre-policy fees unspecified (rephrased)	All user fees abolished
Bauhoff et al., 2011 (Georgia	Country	Remove	Pre-policy fees unspecified	All user fees abolished
Guindon 2014 (Vietnam)	Country	Remove	Pre-policy fees unspecified	All user fees abolished
Huang et al. 2015 (China)	Region	Increase	30%~40% (outpatient) 20% (inpatient)	86% (outpatient) 28% (inpatient)
Abdu et al. 2004 (Sudan)	State	Reduce	Full cost	1. 25% 2. 50% 3. 75%
Ansah et al. 2009 (Ghana)	District	Remove	Paid user fees for health care	All user fees abolished

Quimbo et al. 2011 (Philipines)	Region	Remove	49% of total health-care expenditure	All user fees abolished

Table 5. Effect of increasing user fees on health outcome in low and middle income countries, according to literature review

Study	Country	User fees arrangement	Study population	Study design	Health outcomes and findings	Other outcomes and findings
Huang et al. 2015	China	1. Out-of-pocket increase from 30%-40% to 86% in 2006 for outpatient medical expenditures; 2. Out-of-pocket for inpatient increased from 20% to 35% and fell to 28% in 2006	1991-2006 waves of China Health and Nutrition Survey n=7065	DID	self-reported health status estimated -3.4%, P>0.05 (=1 if poor, =0 otherwise)	1. outpatient care expenditures decreased by 35.2% (P<0.05) 2. inpatient care expenditures decreased by 4.1% 3. outpatient medical care utilization decreased by 7% (P<0.05) 4. inpatient medical care utilization decreased by 0.1%

Watson et al. 2016	Malawi	User fees (dummy) were introduced for consultation fees for visiting clinician, laboratory tests and medications	Routinely collected data from "HMIS-15" report, before uwer fees introduced, total outpatient attendence for study n=26752; total new malaria diagnosis; n=3558 and 5569 for age over 5s and under 5s respectively; new TB diagnosis n=15	DID	1. New HIV cases for age 15-49 years reduced by 48%, 95% CI (-0.64, -0.25) 2. New malaria diagnosis for age over 5 years reduced by 56%, 95% CI (-0.83, 0.14) 3. New malaria diagnosis for age under 5 years reduced by 18%, 95% CI (-0.73, 1.44) 4. 7 cases less at the user fee introducing centres after use fee introduced, similar declines were not seen in the non-user fee introduce health centres	Total outpatient attendances reduced 68%, P=0.048

Note: increasing user fees included both user fees increased and user fees introduced.

Table 6. Effect of reducing user fees on health outcome in low and middle income countries, according to literature review

Study	Country	User fees arrangement	Study population	Study design	Health outcomes and findings	Other outcomes and findings
Nguyen et al. 2012	Vietnam	Program to provide Free Care for Children Under 6 including inpatient and outpatient services, and associated lab tests and generic medicines	Two waves of the Vietnam Household Living Standard Surveys 2004 (n=2941) and 2006 (n=2504)	DID	1. number of sick days reduced 26% (P<0.001) for children aged 4-5 years old 2. Inpatient admission to secondary hospital increased significantly for both age group 0-3 years and 4-5 years by 0.02 (p<0.01) and 0.03 (p<0.01) respectively 3. Inpatient admission totertiary hospital reduced significantly for both age group 4-5 years by 0.035 (p<0.05) but not for age group 0-3 by 0.003 (p>0.1)	1. Out-of-pocket expenditure reduced 1.7% (p<0.01) for age group 4-5 years, 0.9% (p>0.1) for age group 0-3 years 2. Increase in utilization of secondary hospital for outpatient by 0.11 (P<0.005) and inpatient by 0.02 (P<0.001) care for children aged 0-3

Sood et al. 2014	India	Free tertiary care at the point of service in both private and public hospitals to households below poverty line in about half of villages in Karnataka	31476 households in 300 scheme eligible villages and 28633 households in 272 scheme ineligible villages	RD	1. Mortality reduced by 64% (95% CI: 0.4, 0.75) among eligible households below poverty line compared to the ineligible; 2. Mortality has no difference (difference of 0.01%, 95% CI, -0.03, 0.03) between households above poverty line in eligible and ineligible area	1. Out-of-pocket expenditures significantly reduced by 34%, 95% CI: 0.18, 0.51) for admissions to hospitals with tertiary care facilities likely to be covered by the scheme 2. Tertiary care utilization (12.3%, 95% CI: -0.2, 0.45)
Tanaka, 2014	South Africa	Free services to pregnant women included prenatal and postnatal care from confirmation of pregnancy until 42 days after delivery, and all health services to children under six years old became free.	KwaZulu-Natal Income Dynamic Study (KIDS) 1993 wave=1389 households; 1998 wave=1178 households	DID	1. Short term average weight-for-age z-scores (WAZ) of newborns increased by 0.64 standard deviations (P<0.05) 2. Short term average weight-for-age z-scores (WAZ) of children increased by 0.57 standard deviations (P<0.1)	Weight-for-height z-score difference at baseline between high and low treatment was 0.08, P>0.1

Sood et al. 2015	India	No premiums or copayments at the point of tertiary care at both private and public hospitals to households below the poverty line in half of villages in Karnataka from 2010-2012	random sample of 6964 below poverty line households in villages eligible and ineligible for VAS	RD	1. Seeking treatment for symptoms 2. posthospitalisation well-being including self-care (0.108), usual activities(0.212), walking ability(0.7, P<0.01), pain(0.66, P<0.01), anxiety (0.45, P<0.1) and overall health (0.337) 3. Occurrence of infectious during hospitalisation (-9.4%, 95% CI: -20.2, 1.4) 4. Need for rehospitalisation (-16.5%, 95% CI: -28.7, -4.3)	Respondents eligible for VAS were 9.4 percentage points less likely to report any infection after their hospitalisation (95% CI −20.2 to 1.4; p=0.087) and 16.5 percentage points less likely to have to be rehospitalised after the initial hospitalisation (95% CI −28.7 to −4.3; p<0.01)
Beuermann et al. 2016	Jamaica	From out-of-pocket fees to no user fee for healthcare services	the Jamaica Labor Force Survey (LFS) and the Survey of Living Conditions (SLC), yearly waves from 2002 to 2012, sample size 35,434	DID	the policy increased the general health of the benefited population 1. Likelihood of sufferring illness associated with loss of	1. the policy added a yearly average of US$PPP 26.6 million worth of net real production to the Jamaican economy during the period 2008–12

			individual-year observations		normaldays devreased by 28.6% with respect to baseline mean 2. Numbrt of days for normal activities lost due to illness within the past four weeks reduced by 34% with respect to baseline mean 3. ADLs, estimated effect -0.17, P<0.05	2. increased labor supply by 2.15 labor hours per week
Watson et al. 2016	Malawi	Remove user fees (dummy)	Routinely collected data from "HMIS-15" report	DID	1. Too few new HIV cases in the user fees removed centre for analysis 2. New malaria diagnosis for age over 5 years increased by 247%, 95% CI (1.71, 3.43) 3. New malaria diagnosis for age under 5 years increased by 230%, 95% CI (1.06, 4.30) for removing user fees	1. outpatient visit increased by 352% (95% CI: 2.13, 5.54) for removing user fees

					4. 7 cases less at the user fee introducing centres after use fee introduced, similar declines were not seen in the non-user fee introduce health centres	
McKinnon et al., 2015	Ghana, Kenya and Senegal (policy countries); Cameroon, Congo, Ethiopia, Gabon, Mozambique, Nigeria and Tanzania	Ghana (2003): Free deliveries in public, private and faith-based health facilities. Covers all normal deliveries, management of assisted deliveries including Caesareans, and management of medical and surgical complications of delivery; Kenya (2007): Free deliveries in all public dispensaries and health centres, including all supplies required for delivery. The policy	Demographic and Health Surveys (DHS) 1997-2012	DID	Neonatal death reduced by 2.9 per 1000 births (95% CI: -6.8, 1)	1. Facility-based delivery increased by 3.1 per 100 live births (95% CI: 0.9, 5.2) 2. No evidence of association between policy change and increase in Caesarean deliveries 0.3 (95% CI: -4.3, 4.8)

	(control countries)	did not initially cover delivery fees in district hospitals and thus did not apply to Caesarean sections; Senegal (2005): Covers normal deliveries at health posts and health centres and Caesarean sections at district and regional hospitals;				
Bauhoff et al., 2011	Georgia	Medical Insurance Program (MIP) in 2006 for the beneficiaries (cut-off score lower than 70000 or 100000 points in two regions): comprehensive benefit package with few coverage limits and no co-payments; Basic universal	A total sample of 3600 households, with 900 households for each of the two geographically varying thresholds with above and below threfolds	RD	There was no differences in self-reported activities of daily living between beneficiaries and non-beneficiaries	1. The out-of-pocket expenditure were 42%-60% of what non-beneficiaries spent 2. There was no statistically significant impact of MIP (-70000 or -100000) on either outpatient or inpatient service utilization

		package for non-MIP population (cut-off score higher than 70000 or 100000 points in two regions): subjected to co-payments of 25%-50%				
Guidon, 2014	Vietnam	1. HCFP (2003): Financed from general government revenues at both national (75%) and provincial (25%) levels for most outpatient and inpatient care received at government facilities and drugs on the Ministry of Health list. 2. Law on Protection and Care of Children (2005): Free primary health care and curative care at government facilities 3. Student and school children	Vietnam Household Living Standards Survey (VHLSS) 2004 and 2006 with sample n=6575 individuals from 1790 households	DID	HCFP did not have any statistically significant impact on health outcomes (Number of sickness days estimate: 1.185; Number of bed days estimate: 0.812;)	1. Utilization of inpatient services increased more than 50% but not utilization of outpatient services did not alter under HCFP coverage 2. Utilization of outpatient services increased about 17% but not number of inpatient admissions under the Law on Protection and Care of Children 3. Utilization of inpatient services increased more than two-fold but not utilization of outpatient

		health insurance (2010): Private contributions based on ability to pay and general government revenues				services under Student and school children health insurance
Huang et al. 2015	China	1. Out-of-pocket increase from 30%-40% to 86% in 2006 for outpatient medical expenditures; 2. Out-of-pocket for inpatient increased from 20% to 35% and fell to 28% in 2006	1991-2006 waves of China Health and Nutrition Survey n=7065	DID	Self-reported health status estimated -3.4%, P>0.05 (=1 if poor, =0 otherwise)	1. outpatient care expenditures decreased by 35.2% (P<0.05) 2. inpatient care expenditures decreased by 4.1% 3. outpatient medical care utilization decreased by 7% (P<0.05) 4. inpatient medical care utilization decreased by 0.1%
Abdu et al. 2004	Sudan	Eight health centres randomly selected from all health centres in Sinnar State from July 2001 to July 2002: two centres exempted 25%, two exempted 50%, two exempted 75%, two controls with	Baseline household survey for total 600 households (each of eight catchment areas with 75 households); Follow up household survey for total	RCT	1. Malaria diagnosis increased by about 25% for children under 5, almost no change for pregnant women, for no exemption group; increased by about 60% for children under 5,	1. Health services utilization at health centres decreased almost 20% for children under 5, decreased about 63% for pregnant women with no exemption; 2. Health services utilization at

		no exemption	1000 households (each catchment areas 125 households)		about 50% for pregnant women, for 25% exemption group; increased by about 25% for both children under 5 and pregnant women, for 50% exemption group; increased by about 280% for children under 5, about 130% for pregnant women, for 75% exemption group; (comparing the year before trial and the trial year) 2. Full course of drugs bought for malaria treatment reduced about 13% for children under 5, increased about 7% for pregnant women, for no no exemption group; increased about 25% for children under 5, increased 40% for pregnant women, for 25%	health centres increased about 30% for children under 5, increased about 30% for pregnant women with 25% exemption; 3. Health services utilization at health centres increased almost 20% for children under 5, almost no change for pregnant women with 50% exemption; 4. Health services utilization at health centres increased about 30% for children under 5, increased about 20% for pregnant women with 75% exemption;

					exemption group; increased about 24% for children under 5, increased about 43% for pregnant women, for 50% exemption group; increased about 30% for children under 5, increased 20% for pregnant women, for 75% exemption group;(comparing the year before trial and the trial year)	
Ansah et al. 2009	Ghana	Free primary care, drugs and initial secondary care on moderate anaemia	2757 children from 2332 households	RCT	1. There were no differences between intervention (3.2%) and control (3.1%) children in prevalence of moderate anaemia, OR=1.05 (95% CI, 0.66-1.67, P=0.86) 2. There were no statistically significant change in mean Hb concentration between	There was an overall increase in the outpatient attendence by children under 5: 1.Utilization of primary care clinic, RR=1.12 (95% CI, 1.04-1.2, P=0.001) 2.Utilization of hospital, RR=0.93 (95% CI, 0.79-1.11, P=0.43) 3. Utilization of chemical seller,

					intervention (0.75 g/dl) and control (0.71 g/dl) children (P=0.69)	RR=0.9 (95% CI, 0.85-0.97, P<0.001) 4. Utilization of home treatment, RR=0.89 (95% CI, 0.82-0.96, P<0.001) 5. Utilization of traditional healer, RR=1.02 (95% CI, 0.72-1.43, P=0.92) 6. Utilization of normal health care service, RR=0.9 (95% CI, 0.86-0.95, P<0.001)
Quimbo et al. 2011	Philipines	Increase peso ceilings to eliminate copayment for hospitalization	1100 patients each in the intervention and control sites	RCT-DID	The intervention had 12% (P<0.1) and 9% (P<0.1) improvement for not wasted* and CRP**-negative respectively	NIL

Note: Garivia et al. (2006) did not provide statistics for significance level, so the 95% CI for was calculated using effect size ± 1.96*standard error.

Reducing user fees included both user fees declined and user fees removed.

*Wasting was defined as having less than 0.90 ratio of actual weight of a child to his/her ideal weight for actual height

**CRP indicates the presence of an acute infection or other types of inflammation

Table 7. Primary outcomes and secondary outcomes

	Primary outcome				Secondary outcome		
Author	Mortality	Health status	Infectious disease	Others	Access and utilization of health services	Financial protection and coping strategy	Productivity and labor supply
Watson et al. 2016[17]			●		●		
Nguyen et al. 2012[11]		●			●	●	
Sood et al. 2014[13]	●				●	●	
Tanaka, 2014[15]				●			
Sood et al. 2015[14]		●	●		●		
Beuermann et al. 2016[16]		●	●				●
McKinnon et al., 2015[18]	●				●		

Bauhoff et al., 2011[19]		●			●	●	
Guindon, 2014[20]		●			●		
Huang et al. 2015[1]		●			●	●	
Abdu et al. 2004[24]			●		●		
Ansah et al. 2009	●		●	●	●		
Quimbo et al. 2011			●	●			

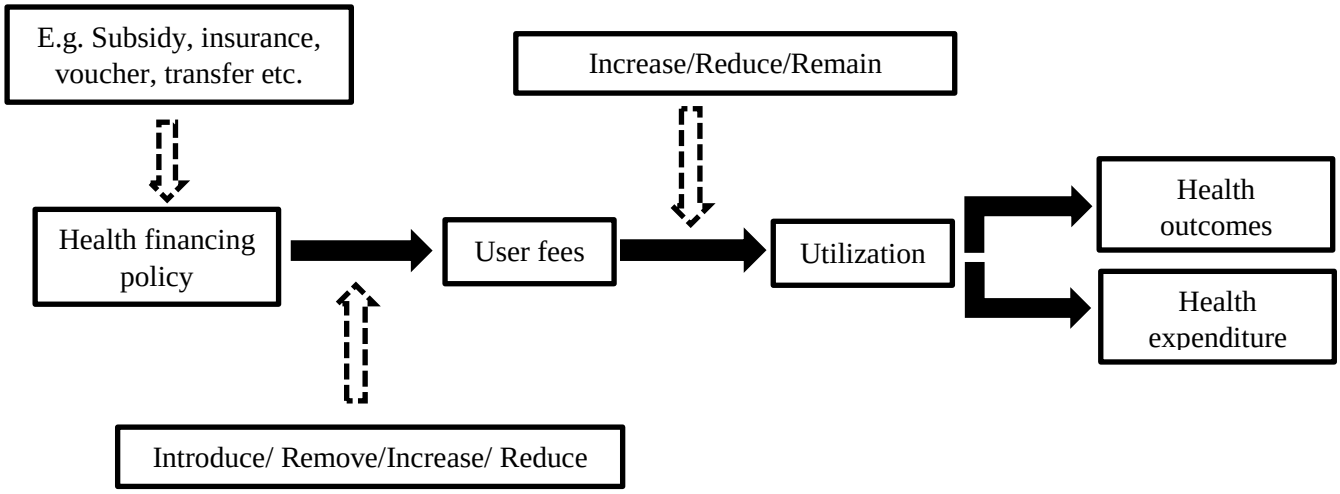

Figure 1. Causal mechanism between user fees, utilization, health outcomes and health expenditure.

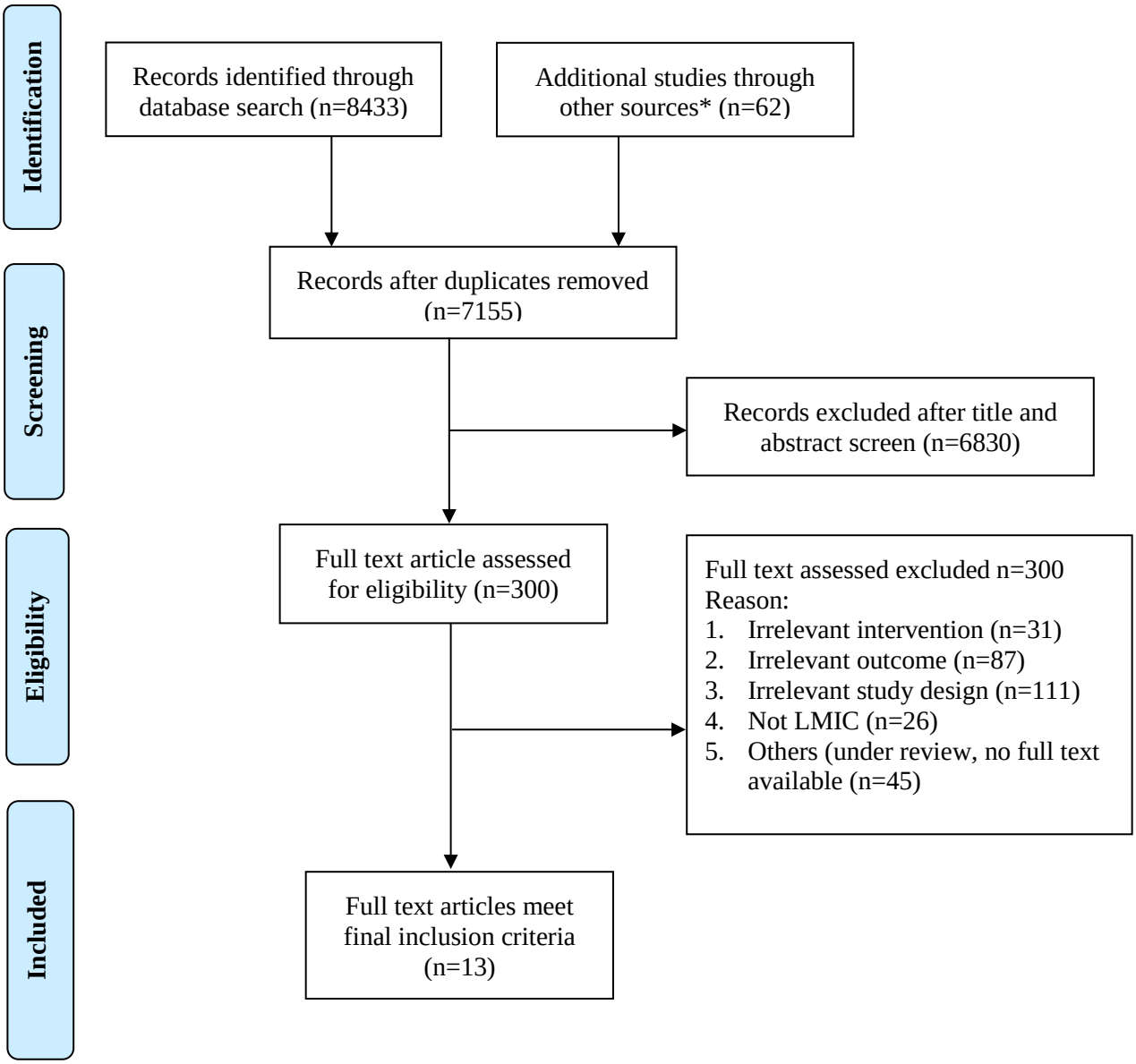

Figure 2. PRISMA flow chart

*Other sources include WHOLIS, World Bank e-library and manually search references of the included papers

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