

# Time for more evidence: a scoping review of the effects of sanctions on Iranian health

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## Research article

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# Abstract

## Background

Islamic Republic of Iran has been the target of massive sanctions since 1979, which got intensified in 2005, 2012, and also in 2015 following JCPOA cancellation. Long-term economic sanctions have impacted Iran's health system. The aim of this study is to examine the impact of sanctions on health system in Iran, and Iranian people's health.

## Methods

A scoping review was performed. PubMed/Medline, Embase, Web of Science, Scopus, and Scientific Information Database were searched from 2012 using the sanction, health and Iran keywords to find the studies that examined the impacts of sanctions on health in Iran. After screening, only original studies, namely studies which collected data through experiments, surveys, observation, interviews, or review of the literature were included, and letters to the editors and secondary reports were excluded. Final listings of articles were supplemented with hand searches of reference listings to ensure completeness. Data on study characteristics and the impacts of sanctions on health were extracted and summarized.

## Result

The preliminary search has identified 273 documents among which 11 articles had the eligibility criteria to be included. They showed remarkable effects of sanctions on access to medicines for the treatment of cancers, non-communicable diseases, asthma, epilepsy, addiction, and hemophilia.

## Conclusion

While there is a scarcity of evidence in quantifying the sanction's impact and also the potential impact on different dimensions of people's health, it seems that innocent people suffered from the economic downturn caused by sanction. The exact impact of sanctions on different health related areas could be the subject of further studies. Furthermore, more vigorous monitoring and evaluation systems are needed to investigate the effects of sanctions on health outcomes and system to be sure that they do not violate people's fundamental human right to health.

## Background

By definition sanctions are assumed to be a peaceful alternative for military action, in order to control governments, individuals or groups. The goal of sanctions generally is to affect the target's behavior, via political and economic interventions, without mass suffering and other complications attributable to wars. Sanctions have various forms; for example, comprehensive sanctions deprive the target from any

international financial trade and service interactions; and in the opposite, targeted sanctions focus on individuals or groups with specific policy or behavior.[1–3]

During past decades, the United States have widely used economic sanctions as a kind of foreign policy so as the European Union and the United Nations. Cuba, Iraq, Haiti, Serbia and Iran more frequently have been the target of economic sanctions[4]. Studies show that sanctions hardly meet their goal in changing the target's political behavior, and instead they have considerable impact on economic indices such as gross domestic product (GDP) and domestic production[5, 6], access to healthcare facilities and medicine,[5] poverty indices[7, 8] and they clearly violate basic human rights. [9, 10]

The Islamic Republic of Iran is second largest country in the Middle East with almost 82 million inhabitants. Two historically remarkable events during past half a century have been the Islamic revolution in 1979, and eight year of war with Iraq, ending in 1988[11, 12] First sanctions against Iran were imposed in 1951, following the nationalization of the oil industry and exit from the Anglo-Iran Oil Company. A report shows that Iran had been the target of over 35 sanction resolutions in 1979–2012, which regarding the number, ranks the top in the world.[9] Most of the sanctions were at the command of the president of America, and member states of the United Nations have had positively voted for four of them. Since 2005, after the International Atomic Energy Agency (IAEA) reviewed Iran's atomic program, sanctions changed in form and intensity, and the UN declared new sanctions in order to affect Iran's uranium enrichment program. Economic sanctions against Iran are mostly related to the military industry, the Islamic Revolutionary Guard Corps, nuclear industry, energy/petroleum industry, banking, shipping industry, and international trade insurance. Undoubtedly, sanctions have profoundly impacted Iran's economic status, for example through a decrease in oil exports and devaluation of the Rial. [3, 9]

At first glance, it appears that sanctions only bear an economic effect on Iran; Also there is not enough evidence available about the exact impact of sanctions in other areas.[13] The aim of this study was to examine the impact of sanctions on health system in Iran, and Iranian people's health. It basically was to answer these questions: "Whether sanctions affect Iranian people's health anyway", "How much the literature is enriched by the evidence on this area", and "Are probable impact on health quantifiable by currently available evidence?" It was considered that the investigated outcome to be related to health (mortality, morbidity, or quality of life), access to medicine, medical equipment, or medical supply, and also social determinants of health.

## Methods

We conducted a scoping review of studies that examined the impacts of sanctions on health in Iran. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) criteria guided reporting of the methods and findings.[14] A protocol for this review was not registered.

## Study eligibility

Studies that examined the impacts of sanctions on health in Iran were considered in this review. Studies which collected data through experiments, surveys, observation, interviews, or review of the literature, whether quantitative or qualitative, had the eligibility criteria to be included in the study; while letters to the editors, secondary reports, and short communications were excluded.

## **Search strategy and information sources**

The search period was restricted from January 2012 onwards, because sanctions on Iran got intensified in 2012,[3, 15] which seems an appropriate interval for assessment of the effects of sanctions, based on published information. The language was limited to English and Persian. PubMed/Medline, Excerpta Medica database (Embase), Web of Science, Scopus, and Scientific Information Database (SID) ([www.sid.ir](http://www.sid.ir)), which is an Iranian database for journals in Persian, were searched. Searches were executed in January 2019 and updated in June 2019 to ensure that we captured all studies published after 2012. In order to optimize sensitivity, the keywords included: “sanction”, “health”, and “Iran”. Searches included both controlled vocabulary and text words. The search strategy was purposefully broad to be as inclusive as possible (Appendix\_1). We also conducted a reference scanning of relevant papers and hand searching of key journals to find further documents and gray publications. Additional search in Google Scholar with the same keywords was done in order to not to miss any relevant document. The citation results were then imported into EndNote X5 software (Thomson Reuters, Carlsbad, CA, USA) and duplicates were removed by one of authors. Thereafter, the studies were checked out by two reviewers independently.

## **Selection of Sources of Evidence**

All identified studies were examined independently by two researchers. Both researchers initially analyzed the titles and abstract of identified studies for relevance. Then the full texts of remaining studies were scanned to decide which study is eligible to be included in the review (regarding the inclusion criteria).

## **Data collection and analysis**

A data extraction form was designed to distil details concerning the origin, aim/s, setting, design, participants, the method of data collection and analysis, and main findings. The findings of selected studies were synthesized. We used World Health Organization Health System Framework to interpret the findings. Thus, the effects of sanctions were categorized into health outcomes (including access, coverage, and quality of care), health impacts (including mortality, morbidity, financial protection, and satisfaction), health system (including governance arrangement, financing arrangement and service delivery arrangements), and determinants of health.

## **Results**

We retrieved 273 records; 98 records were excluded due to duplication. During the initial stage, 160 references, including letters to the editor and articles addressing the effect of sanctions on areas other than health, were excluded on examination of the title and abstract. In the next stage, 15 articles were

chosen for full-text reading, out of which 11 studies were included. The flow chart in Fig. 1 illustrates our selection process.

Therefore, ten out of eleven included studies addressed the effects of sanctions on access to medicine in Iran. Three articles studied medicines holistically,[16–18] seven articles investigated medications related to some specific diseases,[19–25] and the one remaining assessed the effect of sanctions on air pollution.[26] In terms of method, there were 6 quantitative studies, 4 qualitative studies, and one review (Fig. 2). In order to data collection, studies used media, information obtained from city pharmacies, chart review and question from patients,[19, 20, 22, 25]national reports,[18, 23] and literature review.[18, 24] The characteristics of included studies are demonstrated in Table 1.

Table 1  
Summery of the included studies

ID	First author	Aim/s	Main finding(s)
1	Mostafavi SM.[26]	Studying the relationship between economic sanctions and rise in air pollutants	Economic sanctions have had a significant relationship with CH <sub>4</sub> , CO <sub>2</sub> , and NO <sub>x</sub> air pollutants, in the years intervening 2001 and 2013.
2	Ghiasi G.[21]	Examining the Impact of sanctions on availability to asthma medicines in Tehran,a before-after study.	The availability of asthma medicines in pharmacies has dramatically decreased. Service delivery arrangement
3	Kheirandish M.[16]	Analysing the news media of sanction effects on access to medicine	Sanctions negatively effect on access to medicines in Iran; also the number of news media reporting shortage of medicine have had increased from 2011–2013.
4	Shahabi S. [24]	Reviewing the literature and documents regarding the impact of international economic sanctions on Iranian cancer health care	Increase in medicines' price, in addition to the bankruptcy of pharmaceutical factories, has led more than 6 million patients with non-communicable diseases (including cancer) not to get high-quality treatment for their disease. Besides the use of benzene containing gasoline has raised people's exposure to carcinogenic agents.
5	Karimi M. [22]	Studying the effects of economic sanctions on clinical outcomes of patients with thalassemia and hemophilia in Iran	People living with thalassemia and hemophilia, due to sanctions do not have enough access to iron chelators, and coagulation factor concentrates, and are developing more disease specified complications.
6	Deilamizade A.[20]	Addressing the effect of sanctions on illicit drug use	A sharp rise in drug prices has encouraged drug users to use less expensive and more harmful drugs, through more hazardous routes such as intravenous.
7	Asadi-PooyaAA. [19]	A retrograde chart reviewing to investigate the effects of sanctions on drug adherence among patients with epilepsy	Reduction in drug adherence was close to being significant (P = 0.07) before and after 2012; despite some drugs were unavailable after sanctions, and others were much more expensive. Medicine subsidization by the government seems to play an important role.
8	Setayesh S. [17]	Addressing the impact of economic sanctions on Iranian drug shortages, using major pharmacies and news media as sources of data	Of 73 medicines in shortage, almost 50% were in the WHO Essential Medicine List, and 89% were related to NCDs.

ID	First author	Aim/s	Main finding(s)
9	Kheirandish M.[23]	Examining the effect of sanction on access to non-communicable diseases medicines	Among drugs for the treatment of cancer, multiple sclerosis, diabetes, and asthma, asthma and cancer groups are in severe shortage in Iran's pharmaceutical market. Also impacts were higher after sanctioning Central Bank of Iran.
10	Aloosh M. [18]	Addressing the health impact of sanctions in Iran and some other countries, using Central Bank data and the literature review.	In addition to decrease in drugs availability, the GDP and employment rate have been lowered, and death rate due to self-harm and admissions for mental health issues has risen in the sanction period. Greece and Honduras had the same situation during economic recession.
11	Asadi-PooyaAA[25]	Patient survey addressing if there has been changes in the experience of patients with epilepsy, regarding access to Anti-Epileptic Drugs, during past six months.	After intensification of sanctions, some commonly used AEDs are scarcely available, with 53% of patients reporting it. Increase in prices and the obligation to substitute the routine medications with more available ones added to the hardship felt by patients.

Among studies illustrated in Table 1, Shahabi et al.[24] Reviewed the literature assessing the impact of international economic sanctions on Iranian cancer health care. They found that economic crisis due to sanction has led more than 6 million patients with NCDs (including cancer) not to get high-quality treatment for their disease. Besides the use of benzene containing gasoline has raised people's exposure to carcinogenic agents.

Following three studies are somehow based on the data of gray literature, and they did not collect primary data from the field. Kheirandish et al.[16] searched content of media and issued magazines in Iran between 2011 and 2013 (a year before and after 2012) for words "medicine" or "drug", and their Farsi equivalent (i.e., "Daru"); data sources mostly consisted of Magiran, Tabnak website, Iran's Ministry of Health and Medical Education news website (Webda), and Sepid weekly magazine. Similarly, Setayesh and Mackey[17] made a list of drugs in shortage in 2012 and 2013, using the report of the International Institute for Peace Justice and Human Rights,[27] and news media, i.e. Khabar Online and Parsine News as Persian sources; and compared the list with WHO Essential Medicine List and EAR99 List. Aloosh et al. [18] Assessed the World Bank and central bank data and matched them with the literature. The GDP and employment rate have been lowered, and death rate due to self-harm and admissions for mental health issues has risen in the sanction period. Briefly, medication shortage has been more experienced during the sanction period, and also economic indices have been affected.

Keirandish et al.[23] Also used Iran Drug List and Iran Pharmaceutical Registry, to assess the availability and sale of medicines being used for the treatment of diabetes, asthma, cancers, and multiple sclerosis, for 68 months from 2008 to 2013. Ghiasi et al.[21] Interviewed pharmacists working at 44 pharmacies around Tehran, and collected data related to the availability of imported and locally produced medicines for the treatment of asthma, at July 2012 and March 2013, and compared the results. Karimi and

Haghpanah[22] also asked 20 health care professionals who were involved in the care of patients with thalassemia and hemophilia to fill out a questionnaire addressing the changes in the availability, affordability and the usage of the disease-specific medications over past years. Beside this, they reviewed medical records of 69 thalassemia and 40 hemophilia patients and evaluated patients' clinical outcomes at three time points of 2006, 2009 and 2012.

Asadi-Pooya et al.[19] Asked epileptic patients under care at the epilepsy clinic at Shiraz University of Medical Sciences about their drug adherence, and possible causes of poor adherence in patients. They compared data obtained in the two study periods 2010–2011 and 2012–2013. [20]. Similarly Asadi-Pooya et al[25] on 2019, assessed patients' experience in access to AEDs, and if there has been any change in their experience during past six months. Deilamizade & Esmizade[20] interviewed 48 drug users living in Tehran for their prevailing economic and social conditions that they faced, and their reactions to such conditions after sanctions.

All above studies reached similar results of medication and drug shortage, and somehow increase of disease specific complications during sanctions period.

Mostafavi et al.[26] Used a different perspective addressing causal relationship between economic sanctions, macroeconomic variables (i.e., value-added of industry, mine, and oil sectors and non-oil GDP) and environmental pollutants (i.e., CH<sub>4</sub>, CO<sub>2</sub>, and NO<sub>x</sub>). In order to address this causal relationship, they used the "Hsiao causality approach" which analyses the null hypothesis using time series data (2001–2013 in this study) and descriptive statistics theories. Finally, the causal relationship between economic sanctions the rise in CH<sub>4</sub>, CO<sub>2</sub> and NO<sub>x</sub> levels was demonstrated.[26] This was the only study found addressing the effects of sanctions on other social determinants of health than healthcare.

## Discussion

The review aimed to examine the evidence around the impact of economic sanctions on health system in Iran, and Iranian people's health. Our findings showed that most available studies in the literature on this area, have addressed the effects of economic sanctions on medicine accessibility. Economic sanctions have impacted Iranian's access to affordable and quality medicines via a rise in medicine and medical supply prices, and also inducing drug shortages.

## Service delivery and financing arrangements

The health service delivery seems to be impacted in several contexts. Medications being used or treatment of non-communicable diseases,[23] asthma,[28] hemophilia,[22] epilepsy[19, 25] and cancers [24, 29] became non or less-available in Iran's pharmaceutical market.[18] Also plenty of brief reports highlight impact of sanctions on healthcare and medicine availability in Iran[13, 29–46]

Impact of economic sanctions on health service delivery, especially on medication availability reached its highest level in October 2012, when the Office of Foreign Assets Control (OFAC) of the US Department of

the Treasury revised provisions related to Iran's transactions[17]. New regulations named Iranian Transactions and Sanctions Regulations (ITSR) blocked all properties belonging to Iran's government and organizations; and also defined two categories of medical equipment and medicines named Exports Administration Regulation EAR99 and non- EAR99 categories. The ITSR ratification could be the cause of drug shortage in Iran, as EAR99 products were more feasible to be exported to Iran, and unlike the non- EAR99 category, did not need an additional "export license" for exportation from America. Pharmaceutical companies avoid doing transactions with Iranian companies, generally in fear of consequences of sanctions' regulations violation. Pharmaceutical companies in Iran are in charge of production of over 95% of required drugs in the country, but they rely in some extent on the importation of raw materials.[24] Limitation in Active Pharmaceutical Ingredient (API) importation results in drug shortage and has forced companies to import finished products from countries like China and India, which has increased risk of the distribution of drugs with unknown quality and safety.[17]

Multiple studies demonstrate similar results in different countries. For example cancer care for children in Iraq[47–49], importation of medical supply for treatment of diabetes, cardiovascular diseases, and cancer in Syria[50],burden of acute myocardial infarction in Italy,[51] surgical care in California[52],COPD burden in Greece[53], and even health care utilization in America[54] have been affected by economic sanction and economic recessions.

## Health outcomes

Seventy-three drugs were identified to be in shortage in 2012 and 2013;[17] including immunosuppressive, antiepileptic drugs, several vaccines, etc. 89% of drugs in shortage were used for the treatment of non-communicable chronic diseases (respectively MS, Alzheimer, Parkinson, hemophilia, thalassemia, and depression).Road accidents, cancers, non-communicable chronic diseases, infectious diseases, respiratory diseases, and diabetes respectively are the most prevalent causes of death in Iran. [55] This indicates that the above drug shortages could potentially increase the burden of the diseases as mentioned above.[17, 55]

There are evidence supporting that low economic indicators by any cause has been associated with higher child mortality rate. [56] In south/center of Iraq, infant mortality rate and under-5 mortality rate rose significantly from 1980–1988 and then in 1991–2003, which could be attributed to the Gulf war and UN sanctions.[57, 58] Hepatitis B vaccine shortages induced by sanctions, lead to 74 Iraqi children being born with Hepatitis B infection from 1994 to 1998.[59]similar trend was interpreted about HIV/AIDS in 1990–2012, generally in developing countries.[60]

## Social determinants of health

Seldom studies have reported impact of sanctions on the SDH in Iran. We may interpret the potential impact of sanctions, by reviewing similar studies in the contexts of economic sanction/recession in other countries.

Although not properly studied in Iran, the impact of economic sanctions/recession on social determinants of health has been occasionally studied in other countries. Some of them will be discussed.

The death rates due to self-harm and interpersonal violence, if assumed as mental health indicators, rose after economic sanctions were imposed on Iran.[18] the mental health system also in Iraq was wrecked after UN sanctions.[61]there are some evidence suggesting that economic recession has had increased burden of psychiatric disorders and mental health problems in Spain[62] [63, 64], portugal[65],and Italy[66].

In 1980's following economic recession, 46000 teachers lost their job in Zair [67]. About 20% of nurses in Greece had similar experience[68].notably that besides employment being a social determinant of health itself, risk of hazardous alcohol drinking[69], and suicide and mortality rate[70, 71] due to unemployment is shown to be higher in the context of economic crisis[50].

Considering gender equality, sanctions affect population's health disproportionately.in the context of economic sanction. Women are more at risk for getting HIV infection.[72] In the post war/sanction years, Iraqi women suffered from increased rate of anemia, sexually transmitted diseases, and water-borne parasitic infections.[73]

Lack of information and empirical data about impact of sanctions on subjects like mortality, morbidity, quality of life, and also social determinants of health namely food security, employment, habitation, environmental health, transportations and literacy, indicates that the health area has not entirely been under observation and investigation, and thus, sanctions are not acquitted of impacting people's health.

Sanctions, unlike wars, are not under any regular legal regime. According to international humanitarian law (IHL), wars should follow the two principles of "distinction" and "proportionality." The proportionality principle implies the prohibition of any attack that possibly could take a citizen's life, cause damage to him, or destroy his property. Moreover, the distinction principle means that combatants must only target military individuals, and they should distinguish between fighters and citizens[74]. Such regulations do not apply to sanctions, which necessitate monitoring of effects of sanctions, both on behalf of the sender and target countries. This is why monitoring and quantifying the effect of sanctions on different dimensions is an essential subject for taking care of people and can influence global diplomacy.

## Limitations

The strength of the study lies in its originality in synthesizing evidence examining the effects of sanctions on Iranian health. We tried to employ a robust method, however it is possible that relevant papers were not identified and included. That is because scoping reviews are less comprehensive than systematic reviews. Besides, using current keywords, there is a possibility of not identifying the studies addressing indirect impacts of sanctions on health.

## Conclusion

Sanctions are imposed generally with the goal of changing the target country's political behavior, by putting economic pressure on people. Economic sanctions with restricting people's primary sources of income, extensively impact human rights and people's health, by both direct and indirect means. It is not possible to consider the economic sanction as the only determinant of the effects (on access of Iranian's to the services and medicines) and rule out other factors such as managerial ones. However, while it is not possible to quantify the impact of sanction on the health of people by present information, it sounds there is enough evidence to say that worsening of economic condition affects the utilization of services, medicine, and has had others risks on the health of people.

"Right to health" is one of the essential human rights, which is being violated by military/economic sanctions; and Iran is not an exception. Thus, although economic sanctions on Iran do not directly target people's lives, but indirectly affected people's health.

In order to prevent human rights violation due to sanctions, we recommend that those who consider sanction regimens and international agencies such as the United Nations consider human rights and the possibility of suffering people of targeted countries. Also, it is important to monitor the effect of sanctions on human rights violation regularly; and finally target nations aware of human consequences of sanctions and plan against it.

## **Abbreviations**

AEDs Anti-Epileptic Drugs

API Active Pharmaceutical Ingredient

EAR 99 Exports Administration Regulation 99

EML Essential Medicine List

GDP Gross Domestic product

IAEA International Atomic Energy Agency

IHL International Humanitarian Law

ITSR Iranian Transactions and Sanctions Regulations

MS Multiple Sclerosis

NCD Non-Communicable Disease

OFAC Office of Foreign Assets Control

SID Scientific Information Database

UN United Nations

WHO World Health Organization

## **Declarations**

### **Ethics approval and consent to participate**

This research was done without patient involvement. Patients were not invited to comment on the study design and were not consulted to develop patient relevant outcomes or interpret the results. Patients were not invited to contribute to the writing or editing of this document for readability or accuracy.

#### **Consent for Publication**

Not applicable.

#### **Availability of data and materials**

Not Applicable.

#### **Competing interests**

The authors declare that they have no competing interests.

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We have received no payment of any institution for this study.

### **Authors' contributions**

RM came up with the idea of the research. Initial search was performed by HSS and FY. Duplicates were removed by HSS. RM, HSS and FY did title/abstract and full-text screening. RM, HSS, FY and GD were all involved in data extraction, and wrote the body of the manuscript.

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## Figures

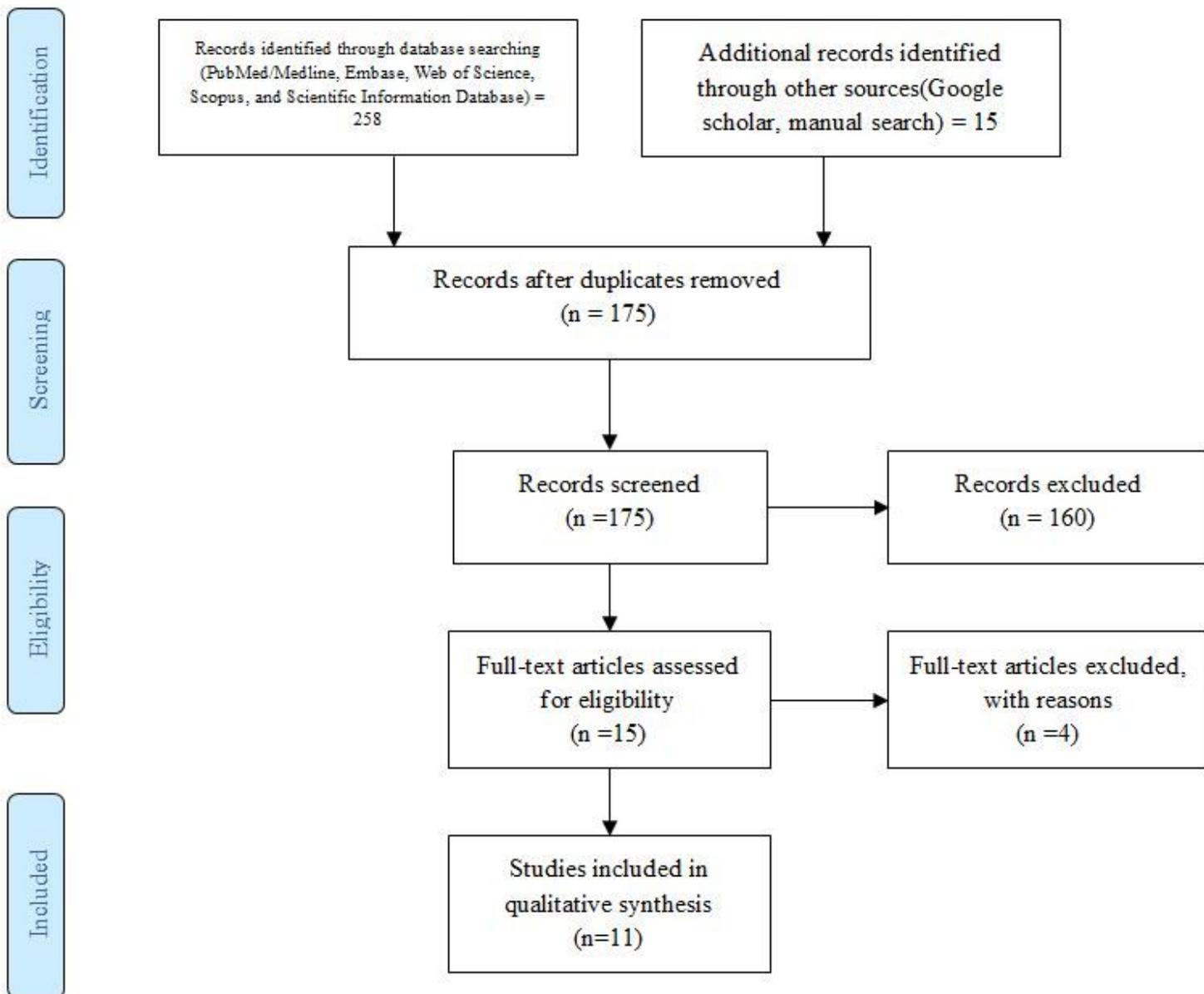


Figure 1

Figure 1

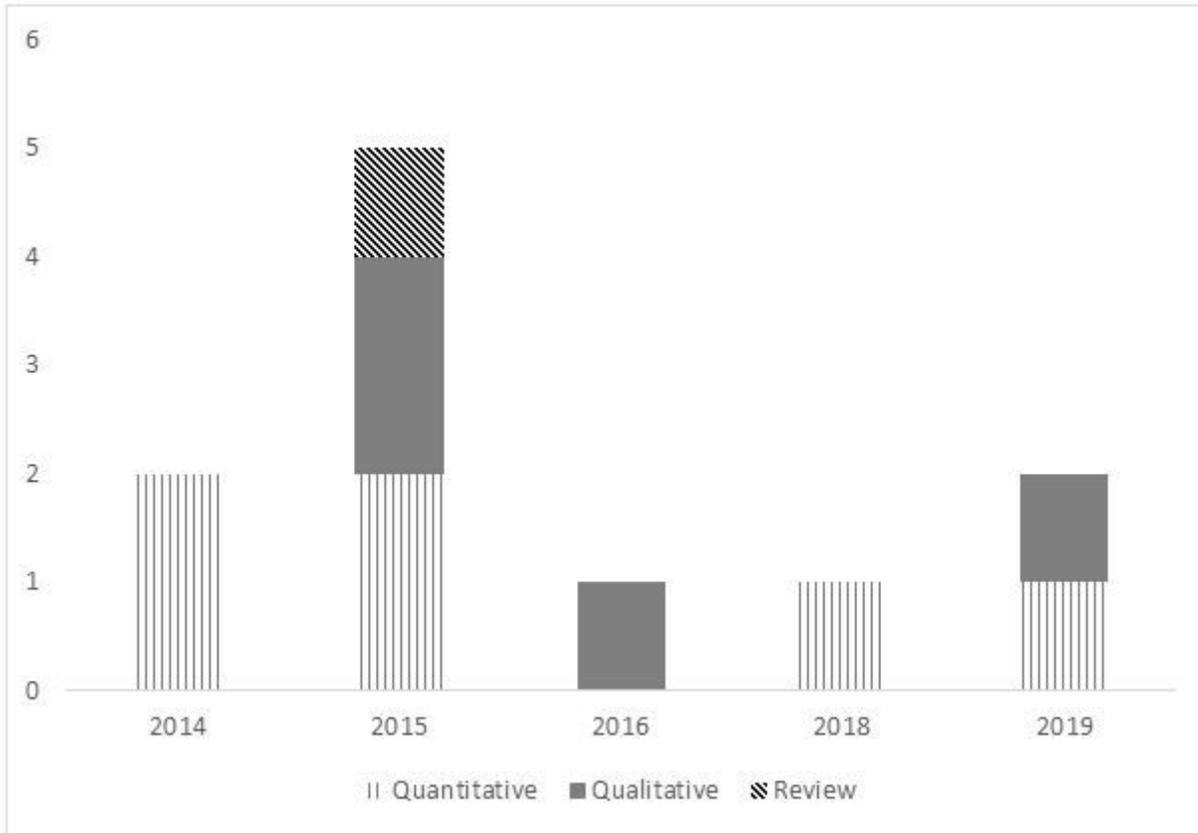


Figure 2

Figure 2

## Supplementary Files

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