

What Has Worked? Lessons from OECD Countries to Tackle Health Inequalities: A Review of the Literature

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Objectives: The main objectives of this study were to evaluate the likely effectiveness of different types of interventions available in the literature aimed at reducing socio-economic health inequalities and highlight appropriate types of interventions to tackle health inequalities for future evidence-based policy. **Methods:** This study systematically reviewed 26 studies to determine the impact of interventions and policies on health inequality. Key databases were searched including EBSCO, PubMed, JSTOR, Cochrane library of databases and DHS database.

Results: Interventions targeting healthy behaviors and prevention were most effective at reducing health inequalities. Interventions based on education and accesses to health care services were mostly successful in reducing health inequality. Interventions on poverty reduction showed inconclusive mixed results, but were mainly unsuccessful. **Conclusion:** Programs based on healthy lifestyle and behaviors, better housing and safe environment and access to health care, specifically improving distribution of health professionals in remote disadvantaged areas are effective to tackle health inequalities.

Keywords: Healthcare Inequalities, Program Effectiveness, Vulnerable Population, National Health Policy, Socioeconomic Factors

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Introduction

The health status of global population has significantly improved during past several decades [1]. However, throughout the world there has growing socioeconomic inequalities in health, and in health status and these differences in health

care services exist in Organization for Economic Cooperation and Development (OECD) member countries [2-4]. These inequalities are even larger in less developed countries for many reasons [5]. There are large inequalities in self-reported health across different income groups in all OECD countries [6]. Governments of OECD countries have developed and

implemented various interventions and policies tackling health inequalities for more than three decades [7, 8]. These countries are on widely different phases of awareness of and willingness to take action on health inequalities. From late 1980s, OECD countries intensified their focus on health inequality, while most developing countries have mainly centered their efforts on measuring health inequality levels.

Evidence for the effects of interventions on health inequality in the literature is richer for OECD countries. Developing countries may learn several lessons from OECD countries as they try to achieve greater progress in reducing health inequality.

How does one tackle health inequality? What could be the most effective and efficient way to reduce health inequalities? These are the key questions that need answers, but there is no single solution for the problem as health inequality is determined by set of complex socioeconomic, individual and biological factors, such as income, education and literacy, employment and working environment, geographical area, age, gender and ethnicity etc. In order to answer these questions, it is important to study the success and failure of past interventions in developed countries. There is substantial literature over the span of decades in these countries exploring causes of health inequality, explaining how to measure it and attempting to answer what reduces the health differences between socioeconomic groups [9-24]. However, very limited literature can be found regarding the effectiveness of programs, interventions and policies attacking health inequality [25]. It is important to learn from the past what has really worked while highlighting areas for future improvement.

The aim of this study was to systematically review the literature to identify studies in OECD countries that have evaluated the impact of public policy or public health interventions aimed at reducing health inequalities and highlight the interventions that have been effective for future evidence-based policy in developing countries.

Materials and Methods

1. Search strategy

Key databases were searched including EBSCO, PubMed, JSTOR, Cochrane library of databases and DHS database. The search was limited to articles in the English language, published from

1980 to recent. The following key words were searched under three main headings: socioeconomic inequalities in health (disparities in health status, socioeconomic health inequality, differences in health status), socioeconomic determinants of health inequality (income, household income, rural/urban, education, place of living, etc), and effects of interventions aimed at reducing health inequalities (policy/intervention on health inequality, impact of policy/interventions, effectiveness of policy/interventions, etc).

2. Inclusion and exclusion criteria

The search identified 78 articles and duplicate publications were removed. Fifty-two papers were excluded on the basis of three criteria: a descriptive or theoretical discussion, papers with only an abstract and no specific focus on effects of public policy or intervention on health inequality. A total of 26 articles were reviewed in detail. A study was included if it met the following six key inclusion criteria:

- Evaluated impact of public policies and interventions on health inequality.
- Measured change in health outcomes, access to health care and healthy behavior of the study populations.
- Published between 1980 and 2017.
- Conducted in an OECD country.
- Published in peer reviewed international academic journal.
- Published in English language.
- Complete peer reviewed manuscript was available, not just an abstract.

Results

1. Classification of interventions targeted to reduce health inequality

Interventions tackling health inequalities appear in many different forms. They involve macro-economic policies, social policies, public policies and poverty eradication interventions, participation of disadvantaged groups in labor market, upgrading housing and environment and improving access to health service, etc.

The classification of interventions aimed at reducing health inequality based on socioeconomic status of targeted population (income, education or place of residence) was challenging for a very simple reason. Most interventions

simultaneously targeted multiple aspects of inequality such as low-income, less educated population, ethnic minority, rural and remote populations of the various disadvantaged groups. In this study, the various interventions were classified based on how they reduced health inequality. These categories are summarized in Table 1.

2. Effectiveness of poverty reduction and labor participation interventions

Income is one of the most important factors of health. Rich people tend to be healthier than poor people. Several numbers of studies can be found in the literature concerning the link between income and health inequality [26-35].

Conceptually, reducing health inequality means improving health of poorest population as fast as possible while health of higher social classes continues to improve [36]. In order to achieve this significant policy goal, it is important to deal with the most basic pre-existing condition affecting health which is income and its distribution. It has been documented in the

literature that the fundamental factors affecting health depend on one's income and its relatively even distribution among members of the population [36-39]. Evidence from studies supports that one of the most successful ways of improving health of disadvantaged groups is to increase their income [40-46]. Evidence for the impact of interventions on income comes in different forms. A total of three interventions were identified targeting socioeconomic disadvantages, including poverty reduction policies, social benefit schemes and increasing labor participation for disadvantaged population. Summary details of poverty reduction and labor participation interventions are provided in Table 2.

Nutrition is a critically important factor of human health and it is true especially for pregnant and postpartum mothers and their children [50]. For low-income families, it is often difficult to give priority to spending for healthy food such as fruits, vegetables, milk and vitamin supplements because of their cost [51]. Elimination of food poverty has always been a top priority of anti-poverty policies and food subsidy programs

Table 1. Classification of interventions aimed at reducing health inequality¹

Type of intervention	Description
Poverty reduction and labor participation	
Non-cash subsidy programs	Food support programs for disadvantaged groups.
Labor participation	Improving labor participation of disadvantaged groups.
Interventions on healthy behaviors and prevention	
Social marketing	Raising public awareness and behavior change.
Prevention	Screening, individual risk factor assessment and immunization.
Health education	Improving knowledge, attitudes and life style.
Housing and supportive environment	
Improving environment	Neighborhood improvements and moving to better areas.
Structural change	Improving living environment such as street layout and green space, better housing, etc.
Access to health service	
Access to health service	Improving access to health care of disadvantaged groups.
Education	
Education	Education policies and interventions aimed at reducing health inequality.
Mixed strategies	
Integrated strategies	Combination of at least two strategies to tackle health inequalities.

¹Classification was done based on the only the articles included.

Table 2. Summary of poverty reduction and labor participation interventions.

Citation (year) Country of study	Intervention	Targeted population/Health outcome measurement if applicable	Learnings from Study
McFadden et al. [47] (2014) UK	“Healthy Start” (HS), Food subsidy program that gives vouchers for fruit, vegetables, milk, and infant formula.	Low income mothers and young children/ improvement of nutrition for pregnant women and young children	This program improved quantity and quality of food of low income pregnant and breast-feeding mothers and children.
Ford FA et al. [48] (2009), UK	Giving “Healthy start” vouchers for fresh fruit, vegetables, milk and infant formula.	Low-income, Caucasian, pregnant and postpartum women living in Sheffield.	Pregnant and postpartum women participated in this program significantly increased their daily intakes of energy, Fe, Ca, folate and vitamin C compared with the Welfare Food Scheme women (similar program as HS).
Crowther R et al. [49] USA and UK	Prevocational training and supported employment program for people with severe mental illness.	People with severe mental illness	Supported employment was an effective tool to help people with mental illness to be employed.

are important component of it. “Healthy Start” is an example of food subsidy programs which provided food vouchers to low-income mothers and young children in United Kingdom and was launched in 2006 [47, 48]. Impact of “Healthy Start” was evaluated empirically by McFadden et al. and Ford FA et al. [47, 48]. Results from these studies provided evidences that food subsidy programs can improve nutrition of low-income mothers and children, but there is a lack of evidence that it improved health outcomes or reduced health inequality.

When we talk about income, we tend to omit non-cash income and its distribution. It is also an important determinant of health and health inequality as same as cash income because significant quantities of economic resources are received in a non-cash form such as health service, education, food, transportation, etc.

Crowther et al. systematically reviewed studies comparing supported employment, prevocational training and basic care for people with severe mental illness as ways to improve their labor participation [49]. This study suggested that supported employment was a more effective tool to help people with mental illness to be employed than prevocational training.

Interventions on healthy behaviors and prevention

Interventions on healthy lifestyle, behavior change and prevention of disease are one of the most common types of interventions aimed at reducing health inequalities in practice because of their nature [52]. Generally, health promotion interventions are easier to measure and evaluate, because most of their effects can be seen within shorter period of time as

opposed to other socio-economic interventions such as poverty reduction and expansion of education. On the other hand, health related behavior, which is usually the main target of most health promotion interventions, is itself heavily dependent on one’s income, education, culture and other factors [53]. Therefore, it is important to understand and modify the health behaviors of disadvantaged groups in order to tackle health inequalities.

A total of seven healthy behavior and prevention interventions were identified targeting reducing health inequality. Table 3 summarizes healthy behavior and prevention interventions and how these interventions impacted on health inequalities. These studies targeted disease prevention, changing health behavior and reducing health inequality by commonly applying different types of research methods including quasi-experimental trials, randomized controlled trials, before and after studies, time series analysis, etc.

Ploeg et al. studied impact of health promotion programs on health inequalities [54]. This study compared the change in body weight status and physical activity level of school children with and without health promotion programs. Their findings demonstrate that comprehensive school health programs in disadvantaged groups can reduce inequalities in physical activity and prevent obesity. They concluded that investments in school-based health promotion programs have a potential to reduce health inequality. A school based anti-smoking intervention was evaluated by Crone et al [56]. They found that education programs leading to healthy lifestyle behavioral changes were effective in the short run. However

Table 3. Summary of interventions on healthy behaviors and prevention

Citation (year) Country of study	Intervention	Targeted population/Health outcome measurement if applicable	Learnings from Study
Ploeg et al. [54], (2014), Canada	School Health program	School children/Body weight status	School health promotion was effective in increasing physical activity and prevent obesity, especially for the children from disadvantaged population.
Walle et al. [55], (1999) Netherlands	Mass media campaign on the use of folic acid to reduce the risk of fetal neural tube defects.	Pregnant woman in the Netherlands	Although, low educated woman was benefited from the program, differences in awareness and use of folic acid by level of woman's education remained the same.
Crone et al. [56], (2003) Netherlands	Antismoking	Adolescents with lower education/ smoking status	This intervention was successful in preventing smoking among adolescents with low education for a short term.
Pinto et al. [57], (2010), USA	Preschool education to low-IQ, disadvantaged African-American children.	Disadvantaged African-American Population/Addictive behavior	Preschool education to disadvantaged children was an effective tool to reduce unhealthy behavior in later-life such as drug and alcohol usage.
O'Neill et al. [58], (2013) Ireland	Incredible Years program, improving the skills and parenting strategies of parents of children with conduct problems.	Children between the ages of 3 and 7 years from disadvantaged area/ Mental health	Incredible Years program offered a cost-effective policy option for reducing behavioral problems of children from economically disadvantaged areas.
Baker et al. [59], (2003), UK	Cervical cancer screening	Woman aged 35-64 from disadvantaged areas/Screening coverage and cervical cancer incidence and mortality	Increasing coverage of cervical screening in disadvantaged areas reduced incidence and mortality from cervical cancer.
Daban et al. [60], (2007), Spain	Preventive practices, such as anti-smoking advice, blood pressure measurement and flu vaccination.	Non-institutionalized residents of the city of Barcelona over 15 years old in the year 2000/Increase in the public health services	Increase in the public health services eliminated inequalities in prevalence of receiving the preventive practices between social class or gender.

positive impacts disappeared over time. Therefore, there was no significant effect on reducing health inequality in long run. Daban et al. suggested that increasing public health services reduces the inequalities in receiving the preventive practices, such as anti-smoking advice, blood pressure measurement, and flu vaccination between the social classes or genders [60]. Baker et al. also found preventive practices such as cervical cancer screening, reduced health inequality gap between wealthiest and poorest groups over time [59].

An interesting study by Walle et al. evaluated impact of mass media campaign aimed to promote folic acid among pregnant woman with different education levels [55]. Results showed that overall usage of folic acid to prevent fetal neural tube defects reduced the incidence of neural tube defects in babies of both low and highly educated woman. However, they did not achieve their main goal of reducing gap between awareness and use of folic acid of low and high educated woman. After the intervention, they found out that the socioeconomic differences still remained.

Housing and supportive environment

Shelter and safe living environment are accepted to be one of the main determinants of health [61-63]. Income, education and place of residence and other socioeconomic factors determine one's living conditions such as their housing and environment. Therefore, interventions aimed at improving housing and living environment of disadvantaged populations likely have the potential to reduce health inequalities [64-66]. Intuitively, providing standard housing for the poor takes less time and costs less money than reducing income inequality or expanding educational level of general population. Five studies were identified that evaluated the impact of housing interventions and one that considered the environment, specifically green space, and these are listed in Table 4.

Howden-Chapman et al. conducted a cluster-randomized study to evaluate effect of improvement of housing quality on health inequality [67]. The program targeted low-income people with old and poor housing conditions in areas with cold weather and the impact of insulating their houses. Warmer houses led to better health outcomes, such as self-reported

Table 4. Summary of housing and supportive environment interventions.

Citation (year) Country of study	Intervention	Targeted population/Health outcome measurement if applicable	Learnings from Study
Howden-Chapman et al. [67] (2007), New Zealand	Installation of a standard retrofit insulation package.	Seven low income communities in New Zealand/Self-reported health and access to health care	Insulating existing houses resulted healthier indoor environment and it improves self-rated health. This intervention reduced self-reported wheezing, days off school and work, and visits to general practitioners.
Mitchell et al. [68], (2008) UK	Green space	Population of England at younger than retirement age/ All-cause mortality and mortality from circulatory diseases	Populations that were exposed to the greenest environments had lowest levels of income related health inequality. Physical environments that promote good health might be important to reduce socioeconomic health inequalities.
Leventall et al. [69], (2003), USA	Moving to Opportunity for Fair Housing Demonstration program	Families from public housing in high-poverty neighborhoods/Mental health	Moving to low-poverty neighborhood resulted significantly less distress. Also mental health of boys in the intervention significantly improved.
Gibson et al. [70] (2011), UK	Scotland's Housing and Regeneration Project (SHARP) for regeneration and relocation to new-build social housing.	Low income groups/Well-being, mental health	Housing and street design had positive impact on mental health and quality of life by altering key psychosocial processes such as control, privacy and sociability.
Kearns et al. (a) [71], (2006), Scotland	SHARP	Low income groups/Well-being, mental health, self-rated health	Self-rated health improved from 26 % to 32 % as tenants reported their general health as 'excellent' or 'very good' after moving to social housing.
Kearns et al. (b) [72], (2008), Scotland	SHARP	Low income groups/Physical health, health behavior	Physical health outcomes and healthy behaviors did not significantly improve for the Intervention Group over time.
Kearns et al. (c) [73], (2008), Scotland	SHARP	Low income groups/Well-being, mental health	With numbers available, no difference in mental health and well-being was observed between the intervention group and control group.

wheezing, days off school and work, and visits to general practitioners and fewer hospital admissions for respiratory conditions for disadvantaged group. The authors suggested that the intervention of upgrading insulation in existing homes had the potential to diminish health inequality.

"Moving to Opportunity (MTO) for Fair Housing Demonstration" is a famous program among economists and public health specialists. It was a program of moving low income families with children under 18 years old from public housing in poor neighborhoods to private housing in better neighborhoods. It was launched by the U.S. Department of Housing and Urban Development in Baltimore, Boston, Chicago, Los Angeles, and New York City between 1994-1998 [74]. The study hypothesis was that moving to better housing and neighborhoods would improve mental and physical health of the disadvantaged population. Leventall et al. tested the hypothesis regarding mental health and found significantly less distress among adults in experimental group than control group [69]. They also found a significant reduction of anxiety

and depression among boys who moved to private housing compared to the boys in control group. Scotland's Housing and Regeneration Project (SHARP) also showed that better housing had an impact on health and well-being. The program aimed to improve the health and wellbeing of tenants by moving them into social housing to improve their housing and surrounding environment. SHARP provided social houses in 60 sites across Scotland between 2002 and 2008. Several evaluations of the impact of SHARP on health outcomes and well-being of the tenants have been done in different stages of program from 2006 to 2011 using different research methodologies. An impact evaluation completed by Kearns et al. found significant improvement in self-rated health status but no significant difference in mental health status of experimental groups [71]. Their next series of impact evaluation studies were conducted in 2008 and determined the impact of social housing on different health outcomes like mental and physical health, behavior and wellbeing [72, 73]. They found that better infrastructure, quality housing and well-planned streets have a significant positive

impact on people's mental health but no or little impact on their physical health and health behaviors. In an observational population study Mitchell et al. again from UK, suggested that healthy environments have great potential to reduce health inequalities [68].

Access to health care

Inequalities in access to health service and uneven service distribution exist in every country harming the health of disadvantaged populations [75, 76]. Therefore, equal distribution of health services and equal access to health care are major challenges of public health policy [77]. Inequality

in access to health care exists for many reasons such as the distance to health care facilities, level of infrastructure, distribution of health care personnel, health care costs and availability of quality and effective treatments etc [78, 79]. Interventions aimed at improving access to health care focused on the above-mentioned factors and were designed to increase access to quality primary care, ensure more even distribution of general practitioners and improve transportation and communication, and many more. The details of these types of interventions are summarized in Table 5.

Weinberger et al. studied effects of increasing access to primary care for chronically ill hospitalized patients after

Table 5. Summary of access to health care interventions

Citation (year) Country of study	Intervention	Targeted population/Health outcome measurement if applicable	Learnings from Study
J Korda et al. [80] (2007) Australia	Universal health care system	Whole population/Non-avoidable mortality rates	Universal health care contributed to decreased absolute socioeconomic non-avoidable mortality but increased relative health inequalities.
Ozegowski et al. [81] (2013) European countries	Policy mechanisms in achieving a more equitable geographical distribution of general practitioners including (1) interventions during medical training; (2) financial incentives; (3) quotas to allocate GPs to regions and (4) capitation-based remuneration.	Rural or socially deprived areas/country-specific equity in the geographic GP distribution served	Quotas based on health care needs to allocate GPs to regions significantly reduced inequality in access to health care. Financial bonuses to GPs working in disadvantaged areas and interventions during medical training had little or no impact.
Rabinowitz et al. [82] (1993) UK	Physician Shortage Area Program (PSAP) in 1974, initiated by the Jefferson Medical College. It combines a selective medical school admissions policy with a special educational program	Rural and underserved areas/The geographic and specialty choices of more recent graduates	PSAP graduates were 10 times more likely to work in rural or under-served areas.
Morell et al. [83] (2014) Australia	Rural health professional program: A case managed recruitment program to improve distribution of health professionals.	Rural and underserved areas/Recruits in rural area	Financial support played an important role for equitable distribution of health professionals. Being domestically trained, having previously lived in a rural or remote area, being a nurse and older age were the variables linked with recruitment in remote area.
Pathman et al. [84] (2004) USA	Financial support to medical students, residents, and practicing physicians in exchange for a period of service in underserved areas.	Rural and underserved areas/Socioeconomic need of communities and patients served by physicians, programs' participant service completion and retention rates, and physicians' satisfaction levels	Loan repayment and direct financial incentive programs were successful in promoting health professionals to work in underserved location.
Weinberger et al. [85] (1996) USA	Increase access to primary care for veterans after discharge from the hospital.	Chronically ill hospitalized patients (veterans)/Hospital readmission, Quality-of-life scores and patient satisfaction	Increase access to primary care for veterans after discharge from the hospital increased rather than decreased the rate of hospital readmission. No effect on quality-of-life scores. However, patient satisfaction increased.

discharge on their quality-of-life scores and patient satisfaction outcomes [85]. They found that patient satisfaction improved significantly, but quality-of-life scores did not change after the intervention. Another study from Australia evaluated the impact of universal health care system on health inequality [80]. It showed that advantaged and disadvantaged groups both benefited from universal health care system, but the health inequality gap between them widened even more.

The remaining studies in this review aimed at improving access to health care by focusing on how to achieve more uniform geographical distribution of general practitioners [81-84]. They used different types of strategies such as selective medical school admissions policy to select more students from rural or disadvantaged areas, training focused on providing care to disadvantaged populations during medical school, financial incentive strategies, quotas to allocate general practitioners to regions and capitation-based compensation. Rabinowitz and Morell found that admitting people to medical school who came from rural areas or had trained in rural areas previously or who had previously worked as a nurse in rural remote area were the most effective strategies. On the other hand, Ozegowski found that these interventions had no impact on increasing general practitioners in remote rural areas [81-83]. In Ozegowski's study quotas determining the number of general practitioners per region were an effective tool to achieve equitable general practitioner distribution. These studies agreed that remunerating general practitioners through capitation payments was an effective policy mechanism [81-84].

Education and mixed strategies interventions aimed at reducing health inequalities

Education plays a major role in socioeconomic gradient in health status [86]. Less educated people tend to be unhealthier than well-educated counterparts [87, 88].

Recently Arroyave et al. studied the contribution of specific causes of disparities in adult premature mortality (ages 25-64) by educational level from 1998 to 2007 in Colombia. They found that adults with primary education had higher premature mortality rates than adults with post-secondary education. Over the 9 year study period mortality rates declined in all educational groups but decreases in mortality were significantly greater for higher-educated men and women [89].

Less education means fewer opportunities to earn a high income and being in a low social class [90, 91]. One study showed that young men belonging to a low social class with no education during have greater risk of dying prematurely [87]. Among causes of death, death from cardiovascular disease the strongest relationship with level of education. Therefore, an important component of interventions aimed at reducing health inequalities was health education of the targeted disadvantaged population [92]. Two articles on effectiveness of health education interventions on health were identified and both of them were found to be effective. Table 6 summarizes education and mixed strategy interventions.

Etile et al. examined the contribution of changes in education to BMI reduction in low-income French adults between 1981 and 2003 [93]. They found that expansion of educational opportunities reduced the body mass index of those with low income.

A recent study by Östergren et al. suggested that education expansion widened educational inequalities in mortality rate because the disadvantaged populations utilized the expanded educational opportunities proportionately less [94]. One

Table 6. Summary of education and mixed strategies interventions.

Citation (year) Country of study	Intervention	Targeted population/Health outcome measurement if applicable	Learnings from Study
Etile et al. [34] (2014) France	Educational expansion policies	Less educated population/BMI	Educational expansion intervention significantly reduced inequality in BMI.
Ostergren et al. [35] (2017) 18 European countries	Educational expansion	General population/Mortality	Level of education was associated with mortality inequality.
G. Fryer et al. [36] (2013) USA	The Moving to Opportunity and investments in school quality	Low-income students growing up in high-poverty neighborhoods/Reducing risky behaviors and mental health	Investments in school quality were effective for reducing risky behaviors. MTO program reduced mental and physical health inequalities.

intervention that used a mixed strategy was called “Moving to Opportunity” in which a group was moved to improved housing with better educational opportunities [95]. It was a randomized controlled trial targeting students from poor families raised in poor neighborhoods. Its results suggest that investments to improve school quality are a very effective way to promote healthy lifestyle and reduce socioeconomic inequalities.

Overall success of the interventions

Table 7 summarizes the overall success of interventions on health inequalities based on their strategies. Most interventions (19 out of 26) were successful in achieving their goal of reducing health inequalities.

Discussion and Conclusions

The purpose of this literature review was to evaluate the effectiveness of different types of interventions aimed at reducing socioeconomic health inequalities. The main challenge of this literature review was the scarcity of evidence of effectiveness of interventions targeted at reducing health inequalities published in peer reviewed scientific journals. Articles related to impact of public policies and interventions mainly concentrated on evaluating the impact on health outcomes of the general population, not how the interventions impacted on different

socioeconomic groups and health inequalities.

This lack of evidence limits the ability to achieve the initial purpose of this study, which was to suggest appropriate evidence based policy interventions to tackle health inequalities in developing countries. This lack of evidence is the main weakness of this study. The evidence for the effectiveness of a certain type of intervention and policy based was often nonexistent or inadequate. For instance, the overall success of poverty reduction and labor participation interventions was based on only 3 interventions available in the literature.

Evidence of impact of public policies and interventions aimed at reducing health inequalities comes in many different forms, often overlapping, making them difficult to isolate and categorize. Whitehead suggested four main types of actions to reduce health inequalities, such as strengthening individuals and communities, improving living and working conditions and promoting healthy macro-policies. Pons-Vigués et al. divided interventions into certain types, including promotion health behaviors, healthy settings, SES context, physical context and combined approach [96, 97]. Similar to Pons-Vigués et al. approach, but in a more focused way, interventions in this study were classified into six types including poverty reduction and labor participation, healthy behavior and prevention, housing and supportive environment, and access to health care, education and mixed strategy interventions.

Table 7. Summary of overall success of the interventions by its type

Type of intervention	Number of identified interventions	Impact on health inequality	Overall success (yes/partly/no)
Healthy behaviors and prevention	7	Yes – 6 Partly - 1	Yes
Access to health care	6	Yes – 4 Partly – 1 No - 1	Yes
Housing	7	Yes – 4 Partly – 1 No - 2	Yes
Education	2	Yes - 2	Yes
Mixed strategies	1	Yes - 1	Yes
Poverty reduction and labor participation interventions	3	Yes - 1 Unclear - 2	Unclear
Total	26	Yes – 19 Partly – 3 No – 3 Unclear-2	

In terms of success, most interventions achieved their initial goal of reducing health inequalities. Although many believe that income and housing are among key determinants of health, interventions based on these two determinants are not always successful in reducing of health inequality. Food subsidy non-cash programs significantly improve quantity and quality of food of targeted disadvantaged population. Intuitively these types of programs will improve health outcome of disadvantaged groups and reduce health inequalities. However, none of the included studies provided clear evidence that they reduced socio-economic health inequalities. Further studies should focus not only how poverty reduction interventions improve access to quantity and quality of food, but also their measurable impact on health outcomes. The true impact of such social policy interventions may only be demonstrated in the long run.

Interventions based on education are one of the main approaches to tackle inequalities in health. This study suggests that improvement and equal distribution of education decreases health inequality.

Effectiveness of interventions to reduce inequality in access to health care is of major interest to researchers and policy makers. Interventions to improve access to health care showed that universal health care system and increased access to primary health care have no impact on reduction of health inequality or were inconclusive. This result is line with findings of Bambra et al. [25]. On the other hand, policy interventions to achieve more even geographical distribution of health professionals showed promising results. Quotas to allocate, financial support and specifically train and incentivize medical students, residents, and practicing physicians to work in disadvantaged areas significantly improved the distribution of health professionals [81-84].

Studies promoting healthy behaviors and prevention, such as school-based health education teaching socially disadvantaged children to change their health-related behavior, showed the most positive results. Preschool and school health programs targeted at disadvantaged groups increased their physical activity and prevented obesity [54]. It also reduced unhealthy behavior in later-life such as drug and alcohol usage and behavioral problems [57]. Prevention strategies and mass media health campaigns elevated awareness and reduced incidence and mortality in disadvantaged areas [55].

These results indicate that when policy-makers and local stakeholders intervene to overcome health inequalities, they should develop programs based on healthy lifestyle and behaviors, better housing and safe environment, and to evenly distribute access to health care.

Future studies of public policy interventions to reduce inequality in food, housing, and education should also focus on the direct impact of these inventions on health and their impact on tackling health inequalities. For instance, it is not only important to examine how food subsidy programs improve quantity and quality of food of low income pregnant and breast-feeding mothers and children, but also it is important to study if the improved nutrition measurably improved the recipient's health. Further health-related impact evaluation studies are also needed, particularly on the long-term effect of poverty reduction and housing interventions.

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Conflict of Interest

The author states no conflict of interest.

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