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Demand-side Interventions to Control Moral Hazard in Health Systems, Beneficial or Detrimental: A Systematic Review Study

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Abstract

Background: Moral hazard is one of the main reasons for health market failure where supply-side and demand-side interventions are used for its control and prevention. This study aimed to identify the effects of demand-side interventions on moral hazards in health systems.

Methods: For this systematic review, electronic databases, including Scopus, PubMed, Web of Science, Embase, ProQuest, Google Scholar's search engine, and Iranian databases such as SID and Magiran, were investigated. No time limitation was considered in the search process. The narrative synthesis approach was used for data analysis.

Results: Out of 7484 retrieved papers, 61 papers were included in the study. The Identified effects were divided into 2 categories: health services consumption effects and financial effects, which were summarized in the form of advantages and disadvantages. The most important advantages included a decrease in the utilization of different services and a reduction in health expenditures. Also, the most important disadvantages included lower quality of care, shifting financing burden to the consumers, and limited access to necessary care.

Conclusion: The results showed that the most benefits of interventions, especially in cost-sharing and waiting list interventions, are for insurance organizations, where the disadvantages also affect consumers more. Therefore, it is necessary to pay more attention to these effects and their management because a lack of attention in this regard may impair the performance of insurance financial protection and health provision as one of the major goals of the health system.

Keywords: Demand-Side Intervention, Moral Hazards, Health Systems

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Introduction

The uncertainty feature of health care makes the time of need for health services and their costs unpredictable (1). Insurance coverage is a solution to the uncertainty of health care (2) and fair financing of health services (3). Experts believe that insurance coverage distorts the patients' choices and creates a problem known as a moral hazard (4). Moral hazard is a situation in which the consumer demands additional health services because of the insurance coverage and reduction in the price of health care (5). Moral hazard as a topic in the fie ld of behavioral economics in addition to changes in consumption behavior—leads to a reduction in preventive behaviors because of the reduced financial cost of health consequences. Insurance coverage also changes the behavior of the provider so that the provider

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↑What is "already known" in this topic:
Moral hazard is one of the health market concerns that affect both the provider and the consumer of health services, and its control methods are classified into supply-side and demand-side interventions.

→What this article adds:
The effects of demand-side interventions are presented in this work as 2 general effects: health-care consumption effects and financial effects, which are summarized as advantages and disadvantages for each intervention.

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also has no incentive to provide the optimal service and creates an induced demand for the patient to increase her income and benefits; (6) therefore, it is known as the consumer moral hazard and provider moral hazard (7).

Moral hazard is one of the main reasons for the failure of the health market (8). Reduction in welfare, reduction in insurance coverage, and increase in health costs are the negative consequences of moral hazard (9). Evidence shows that health care costs have increased in recent years (10, 11). The increase in health spending was equivalent to 9% of Gross Domestic Product (GDP) in the Organization for Economic Co-operation and Development countries in 2018 and 18% of GDP in the United States in 2015. Moral hazard is recognized as one of the main factors in increasing the cost of health (12).

Some interventions have been proposed to manage and reduce moral hazards. These interventions are divided into 2 categories: (1) supply-side interventions and (2) demand-side interventions. Supply-side interventions are used to control provider moral hazards, and demand-side interventions are used to control consumer moral hazards (7). Referral system and gate-keeping, managed care, payment systems such as diagnosis-related group per capita payment and global payment, consumption pattern review, statistical reports, and prospective consumption monitoring are the most common interventions to prevent and control moral hazards in supply-side (13, 14). The most important demand-side interventions include cost-sharing, medical savings accounts (MSA) or health savings accounts (HSA), waiting lists, and nonuse incentives schemes (7).

Cost-sharing is a method whose aim is to increase the responsibility of individuals by participating in the payment of health costs through out-of-pocket payments (15). Cost-sharing is determined in different ways, such as deductibles, coinsurance, copayment, and ceiling (16). Cost-sharing, while reducing the consumption of health services, can reduce insurance costs by preventing moral hazards. This method is common in countries with social health insurance (17). Medical savings accounts are kinds of personal accounts in which enrollees save a portion of their income to pay for health expenses. Health saving accounts are a financing tool, which is also used to control the consumer moral hazard (18). The waiting list is a method that rations health care according to the waiting time (19). The waiting list, by imposing the cost of time instead of paying directly, will reduce moral hazard (13). Nonuse incentive schemes encourage low consumption or nonconsumption in exchange for a lower premium (13) or generous coverage in the next contract (20). The premium reduction is often used to risk adjustment schemes (21).

Since the implementation of any intervention requires the identification of possible consequences for planning to be dealt with, this study aimed to identify the effects of demand-side interventions to control the moral hazard. Our focus in this study is on studies that have sought to reduce consumer moral hazard and used demand-side interventions in this regard. The results of this study are expected to be useful in reducing moral hazards planning and ultimately reducing health costs.

Methods

Data Sources and Searches Strategy

In this systematic review, the following electronic databases were searched until February 7, 2021: Scopus, PubMed, ISI Web of Science, Embase, ProQuest, and Iranian databases including SID and Magiran. Google Scholar's search engine was used to ensure that all relevant records were covered. No time limitation was considered in the search process. On January 15, 2022, the databases indicated were searched to ensure that the most recent relatedstudies were not missed. During the new search, several studies were added. The main keywords used for searching databases included "moral hazard", "principal agency problem", "principal-agent dilemma", "principal-agent problem", "unnecessary use", "unnecessary utilization", "non-essential use", "non-essential utilization", "overutilization", "health", "health system", "health insurance", "health care", "healthcare", "health service", "medical care", and "medical service" (Appendix 1).

Inclusion and Exclusion Criteria

All Persian and English papers that examined the effect of demand-side interventions on controlling moral hazard or consumer moral hazard in health systems were included in this study. Papers without full texts, letters to editors, books, reports, seminars, and conference presentations were excluded.

Screening and Study Selection

Founded records were imported to the Endnote software Version 9. After removing duplicate papers, 2 skilled researchers independently conducted an initial screening of the records' titles. In the second step, the abstracts of the remaining papers were screened independently by 2 researchers, and unrelated papers were removed. In the final screening round, the full texts of papers were independently assessed for inclusion and exclusion criteria by 2 authors. Any disagreement between the researchers was resolved by consultation with a third reviewer. Also, references of the selected papers were assessed to find additional papers. The literature selection and retrieval flow diagram are shown in Figure 1.

Data Extraction and Quality Assessment

Data extraction was performed based on the following information: author (s), year of publication, country, study language, title, study design, demand-side intervention, analyzed outcome, main results, and quality appraisal score. Quality appraisal of the papers was performed using the Dixon-Woods quality appraisal checklist (22). The general characteristics of the included studies are presented in Appendix 2.

Data Analysis

The narrative synthesis approach was used to summarize

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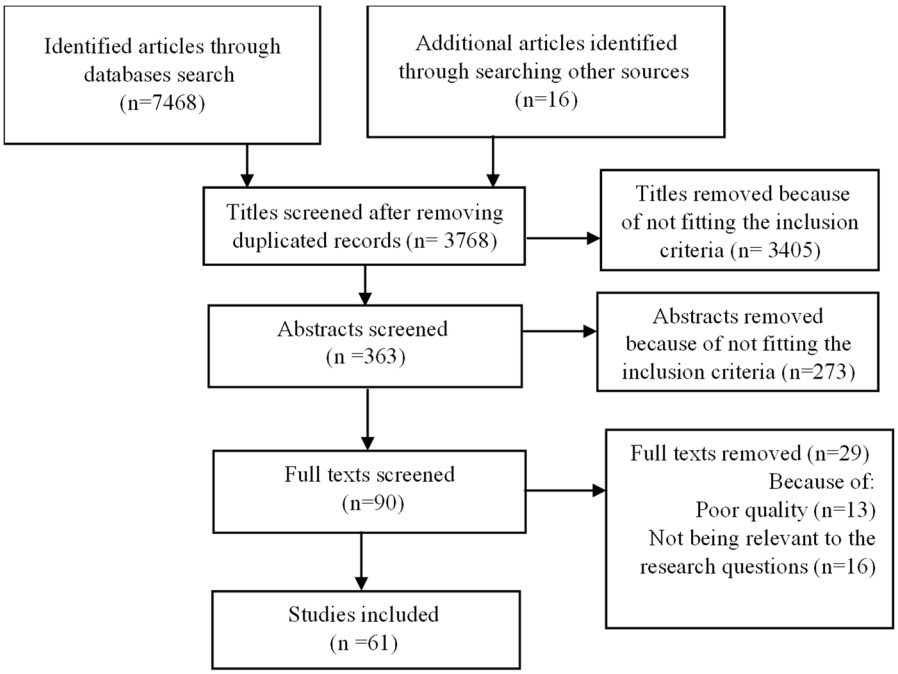

Fig. 1. Literature selection and retrieval flow diagram

the results of the studies because the studies were heterogeneous in terms of the type of study, lent of study, type of demand-side interventions and how to implement them, outcome variables, and high diversity in the approach of analyzing and reporting results. Thus, it was not possible to select a common criterion for the relationship between studies for meta-analysis. Hence, the findings are synthesized in text and table format to provide a summary of the effects and consequences of demand-side interventions.

Results

In the search of databases (N = 7468) and other sources (N = 16), a total of 7484 records were found after removing duplicate records and reviewing the inclusion and exclusion criteria during the screening steps of titles, abstracts, and reviewing the full text of selected papers. A total of 61 papers were included in the study (Fig. 1).

The time of publication of the articles are from 1995 to 2000 (N = 1), from 2001 to 2005 (N = 9), from 2006 to 2010 (N = 10), from 2011 to 2015 (N = 17), as well as 24 studies from 2016 to 2021. Most studies were conducted in a quantitative approach (N = 44), but they were also in a qualitative approach (N = 2), review approach (N = 4), and theoretical approach based on the model formulation (N = 11). Demand-side interventions in these studies included cost-sharing (N = 47), medical or health savings accounts (N = 4), waiting lists (N = 4), and nonuse incentives (N = 6).

The main findings of the study on the effects of demand-side interventions were presented in Table 1. The identified effects of the study were divided into 2 general effects: (1) health services consumption effects and (2) financial effects for each intervention. Health services consumption effects show the effect of interventions on outcomes such as demand and utilization of various health services, access to health services, and issues related to the quality of health services. Financial effects also show the effect of interventions on the expenditure of different health services, financial effects for consumers, and insurance organizations or other third-party payers.

Table 2 shows the most important advantages and disadvantages of demand-side interventions.

Discussion

This systematic review study aimed to identify the effects of demand-side interventions to control moral hazards in health systems. A variety of study objectives and methods were reviewed and reported in this study. The majority of studies investigated the effects of cost-sharing methods. The basis of cost-sharing goes back to the theory of moral hazards where nonparticipation in costs leads to reckless choices and increased costs (76). The study's findings show that a variety of cost-sharing schemes exist—including uniform and fixed-rate cost-sharing, shift deductibles, high-level cost-sharing plans such as higher deductibles, high deductible health plans (HDHPS), consumer-directed health plans (CDHPS), and value-based cost-sharing or value-based insurance design (VBID)—which determines the cost-sharing rate based on the price elasticity of demand for health services. The bulk of the results related to cost-sharing showed a significant reduction in the consumption of health services; a few studies indicated no or little effect on consumption; this variation in results is expected in different studies due to the variety of regulatory cost-sharing rates in different countries. Regarding the reduction of service consumption, some essential points should be mentioned. The transitory effect is one of the significant issues in reducing the consumption of health services. In Kan and

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Table 1. The Main Effects of Demand Side Interventions

Demand-side intervention	Health services consumption effects	Financial effects
Cost-sharing	- Deductibles reduce the consumption of different services (16) - Copayments decrease the utilization of ambulatory services (23-31) and prescriptions drug (25, 32) - Reduction in unnecessary emergency room visits in copayments plan (33-35) - Transitory negative effects of copayments on the frequency of physician visits (36) - Negative relationship between moral hazards and coinsurance (9) - Reduction in elective and preventive services with higher cost-sharing (37) - Correlation between the deductible rate and health care utilization (38) - No effect on the primary care physician visits (39-41) and hospitalization in copayments plan (25, 29) - Copayments do not affect the nonemergency visits in emergency departments (42) - No deterrent effects for seeking the healthcare in vulnerable groups in copayments (26, 41) - The substitution effects from services need cost-sharing to free services or with less out-of-pocket payment(25, 27, 43) - Increasing hospitalization with copayments (16, 24) - limited or negative effect on access to long term care (44) - Reduction in utilization of both efficient and inefficient care (21, 45) - Limiting access to health services (21) More sensitivity of low-income patients for health care utilization (25, 26, 28) - Less sensitivity of inpatient service users to cost-sharing than that of clinic users (46) - Inducing inequitable service utilization (46) - Reduction in ambulatory services in voluntary deductible(5) and HDHPs (45, 47) - Higher deductibles reducing deferred care (48) - Correlation between the HDHPs and lower smoking (49) - Moderate reduction in-office visits and general laboratory tests among the HDHPs enrollees (50) - No differences in visit rates for acute conditions and radiology tests among the HDHPs enrollees (50) - No significant effect of the variable deductible on utilization (51) - Positive effect of the voluntary deductible on the number of spending in the hospital (5) - Little effect of the average income-based deductible on access to medications and other health services (52) - Increase in demand for specialist visits, diagnostic tests,s and medication utilization with cost-sharing exemption (53) - Reduction in use of preventive care among the HDHPs enrollees (45, 47, 54) - Existence of intertemporal substitution effects in the HDHPs enrollees (55) - Reduction in medication adherence among the HDHPs enrollees (45) - More delayed care in vulnerable groups in higher deductible plans (48) - Omitting needed the care to save money among the HDHPs enrollees (45) - Increasing medication adherence among the VBID brand statin users (56)	- Decreasing effect of copayments on pharmaceutical expenditure (32) - Negative and retained effects of copayments on visit expenditures (36) - Increase in profit of insurance companies due to reduced consumer financial claims in deductible plan (16) - Slight decrease in expenditure (12) - Increasing cost-containment incentives with the deductible amounts (57) - Positive effect on the efficiency of long-term care (44) - Modest efficiency gain in uniform copayments (27) - Higher reduction of ex-post moral hazard in copayments with the premium reduction frame (58) - Increasing financing burdens on deductibles plans (16) - Shifting the financing burden to the consumers in copayments plans (25) - Deductible is not an optimal solution because of its adverse effects (21, 43) - Increasing the effect of copayments on medical costs because of increasing inpatient services and substitution effects (24) - Small price sensitivity for the GPs visit in acute conditions and strong sensitivity in chronic conditions to the copayments (31) - leading to inefficient care (21) - lower health care expenditure in the HDHPs and CDHPs (45, 54, 59) - Decreasing the effect of higher deductible plans on medical debt (48) - lower out-of-pocket expenditures in shifted deductibles (60) - Improving the healthcare price transparency in the CDHPs (59) - Safe reduction of public spending on medicine in some groups in average income-based deductibles (52) - Optional deductibles are compatible with the principles of solidarity (61) - Voluntary deductibles reduce insurance claims (moral hazard) (61) - Higher spending in the free care plan at the beginning of a coverage year and higher spending in high deductible plans at the end of a coverage year (55) - More medical debts for vulnerable groups in higher deductible plans (48) - Healthy people, men, and highly educated ones are more likely to have a voluntary deductible (5, 62) - Tiers cost-sharing is effective for demanding low-priced drugs (63) - Treatment-specific copayments cause reductions in moral hazard (64) - Differential cost-sharing based on the disease status is the optimal health insurance(65) - Value-based cost-sharing is the optimal health insurance (66)

* High deductible health plans (HDHPS), **consumer-directed health plans (CDHPs), ***Value-based Insurance Design (VBID, ****GPs: general practitioners

Suzuki's study, the effect of reduction in demand for physician visits following the increase in coinsurance rate was not sustainable 6 months after the implementation of the program (36). The substitution effect is another significant effect of reducing service consumption. This effect shifts services with cost-sharing to free services or services with less cost-sharing (43, 27, 25). Since usually hospital ser-

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Table 1. Continued

Demand-side intervention	Health services consumption effects	Financial effects
Medical Saving Accounts (MSA) / Health Saving Accounts (HSA)/	- Negative relationship with outpatient utilization (18) - Suitable for enabling consumption (18) - Negative effect on reducing moral hazard (67)	- Restrictions on the use of funds (67) - Increasing individual savings or preventive behavior (68) - Reducing members' health costs due to reduced MSA funds (69) - Being useful to reduce costs and save for the future (18) - Having a negative effect on containing medical expenses. (67) - Having a positive effect on medical expenses for healthier groups (67) - Reducing savings in health accounts despite generous employers in voluntary design (54)
Waiting time	- Lower optimal quality of health care (70) - Reduction in the public sectors' incentive to reduce waiting time by the presence of private sectors (71)	- Patients' willingness to pay for a reduction in waiting time(70) - No optimal design (19, 70, 72) - No welfare gain (70) - potentially encouraging high-income patients or patients with high waiting costs to select private settings (72)
Non-use incentives	- Increasing Risk reduction behavior and improving the utility of insured people (20) - Reduction in the likelihood of visiting GPs (73) - Reduction of moral hazard (73) - Limited effect of extensive risk adjustment on access to long term care (44) - No restriction on consumption of efficient care(21) Less optimistic and less justified compared to cost-sharing. (74)	- Limited effect on the efficiency of long-term care (44) - Reduction in the cost of general practitioner visits (73) - Lower social costs with a smaller patient risk premium than the price of provider information (75)

* High deductible health plans (HDHPS), **consumer-directed health plans (CDHPs), ***Value-based Insurance Design (VBID, ****GPs: general practitioners

Table 2. The Most Important Advantages and Disadvantages of Demand Side Interventions

Demand-side intervention	Advantages	Disadvantages
Cost-sharing	- Decrease in the utilization of different services, especially ambulatory services (5, 16, 23-35, 37, 45, 47, 54) - Having lower health care expenditure (32, 36, 45, 52, 54, 59-61, 63, 64) - Increasing profits of third-party payers due to reduced consumer financial claims (16) - Improving healthcare price transparency in CDHPs (59)	- Lower quality of care because of: o More hospitalization due to substitution effects (16, 24) o Decreasing the utilization of both efficient and inefficient care (preventive care, medication adherence,) (21, 45, 47, 54) - limiting access to necessary health services with increased cost-sharing (21, 44, 45) - Shifting financing burden to the consumers (16, 25) - Increasing total medical costs because of substitution effect from cares with cost-sharing to free or less out-of-pocket care (24, 25, 27, 43) - More sensitivity of low-income patients (25, 26, 28, 48)
Medical Savings Accounts (MSA)/ Health Savings Accounts (HSA)/	- Being suitable for enabling consumption (18) - Increasing savings for the future (18, 68) - Reduction in health expenditures (18, 69)	- Restrictions on the use of funds (67)
Waiting time	- Reduction in public health costs because of shifting high-income and high-waiting costs of consumers to the private sector (71, 72)	- lower quality of care (70) - patients' willingness to pay for a reduction in waiting time (70) - No welfare gains (70)
Non-use incentives	- No restriction on the consumption of efficient care (20, 21)	- Less optimistic and less justified compared to cost-sharing (74)

vices have lower cost-sharing because of less price elasticity, by shifting services from outpatient to inpatient, a reduction in the quality of services due to inpatient complications is excepted. It will also increase the total cost of health. These results are consistent with the results of a study by Yoo et al, where the increase in cost-sharing for outpatient services led to an increase in hospitalization and health costs (24).

Fels in a model-based analysis showed that cost-sharing is a nonoptimal method because of the reduction of both essential and nonessential services (because of patients' mistakes in distinguishing between essential and nonessential services) and reduction in access to health services (21). The results of this analysis are in line with the findings of

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the following studies about a reduction in the use of preventive care (45, 47, 54) reduction in medication adherence (45), and more sensitivity of low-income patients to cost-sharing for health care utilization (25, 26, 28). In this regard, value-based cost-sharing methods seek to eliminate the shortcomings, which also achieved positive results in this regard (56).

From the financial dimension, the effect of cost-sharing included a small to a significant reduction in health care costs (12, 32, 36). Although the reduction of health costs is one of the most important positive findings of cost-sharing, the exposure to the following side effects in studies criticizes this achievement: shifting the financial burden to consumers (25), increasing the financial burden for consumers (16), and increasing health costs because of increased hospitalization (24). However, the results of empirical illustration showed that shift deductible plans reduce out-of-pocket payment costs (60). Moreover, in response to these shortcomings, value-based cost-sharing schemes were proposed as optimal methods (64-66). As a final point, increasing the profits of insurance organizations because of the reduction of insured claims is another positive and significant consequence of cost-sharing (16, 61).

Savings accounts are one of the means of financing and controlling consumer moral hazard and are also useful for future saving, which is implemented either compulsorily or voluntarily (18). Despite this function, the results of a study showed negative results in reducing health costs and reducing moral hazard in China, which the authors consider a result of the compulsory membership and social participation in the project, being less valuable compared with out-of-pocket payments. (67). Furthermore, the results of a study on the effect of health savings accounts on savings and the promotion of preventive behavior showed that the members of this plan do not perform both savings and preventive behavior at the same time (68). In addition, the results of another study showed that savings are reduced in voluntary schemes with generous employers (54). Generally, the results of studies on the consequences of savings accounts on the consumption of health services and costs were different, which were expected to be like this because of mandatory and voluntary membership and type of administration in different countries.

The waiting list is an alternative to a user fee to reduce costs in countries with national health systems that control unnecessary demand by imposing the cost of time (14). The results of the included studies on the waiting list indicate that this intervention is not desirable from the perspective of patients (70) and is nonoptimal (19, 70, 72). The waiting list reduces health costs by potentially encouraging high-income patients or patients with high waiting costs to select a private setting (72). Although reducing the costs through the choices of private sectors by high-income people is considered an advantage, the result of the analysis by Olivella showed that the presence of the private sector reduces the willingness of public sector providers to reduce waiting time (71).

Nonuse incentive schemes or bonus insurance often offers rewards in the form of a reduction in the next year's premiums(13) or generous coverage for the next contract (20). These interventions aim to promote healthy behavior, prevent high-risk behaviors, and control demand from the source (74) without access restricting (21). The findings of the included studies showed positive findings in the direction of the goals of these programs. However, the public acceptance of these methods in a qualitative study showed less justifiability of these methods compared to cost-sharing methods (74).

Limitations of the Study

This study had some limitations. The first limitation was the methodological diversity of the studies and their heterogeneity therefore the narrative synthesis approach was used to summarize the results of the studies. The second limitation was the possibility of language bias due to the limitation of non-English articles on publishing or indexing the results and the focus of this study on Persian and English articles which led to the absence of studies in other languages in the analysis of results. Another limitation was that the majority of the studies concentrated on the impacts of cost-sharing, with fewer studies looking at the effects of other demand-side interventions. Finally, there was the possibility of researcher bias in favor of a specific intervention, which might have influenced the study's outcomes.

Conclusion

Demand-side interventions were designed to reduce consumer motivation for unnecessary consumption. The results of this study showed that each of these interventions has advantages and disadvantages. The most important strengths of these interventions, in general, include reducing the consumption of health services, especially outpatient services, and reducing health costs and third-party payers' costs. The downsides of these approaches include a reduction in service quality, a transfer in a financial burden to consumers, and limited access, particularly for low-income populations. When looking at the outcomes of interventions, it becomes clear that the majority of the benefits, particularly in cost-sharing and waiting list interventions, benefit insurance companies and third-party payers, while the drawbacks of these interventions disproportionately burden consumers. Therefore, in regulating these interventions in health systems and insurance organizations, it is necessary to pay more attention to these consequences and their management, as a lack of attention in this regard may impair the performance of insurance financial protection and health provision as one of the major goals of health systems.

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Ethical Approval

The study was approved by the local ethical committee

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Conflict of Interests

The authors declare that they have no competing interests.

References

1. Khorasani E, Keyvanara M, Etemadi M, Asadi S, Mohammadi M, Barati M. Insurance companies' point of view toward moral hazard incentives. J Med Ethics Hist Med. 2016;9:12.
2. Mohammad Taghizadeh S Goudarzi R, Amiresmaili MR, Malekpoor Z. The effect of moral hazards in the health insurance industry in Iran. Health Develop J. 2018;6(3):216-27. [In Persian].
3. Obermann K, Jowett M, Kwon S. The role of national health insurance for achieving UHC in the Philippines: a mixed methods analysis. Glob Health Act. 2018;11(1):1483638.
4. Whaley CM, Guo C, Brown TT. The moral hazard effects of consumer responses to targeted cost-sharing. J Health Econ. 2017;56:201-21.
5. Alessie RJM, Angelini V, Mierau JO, Viluma L. Moral hazard and selection for voluntary deductibles. Health Econ. 2020;29(10):1251-69.
6. Sohn M, Jung M. Effects of public and private health insurance on medical service utilization in the National Health Insurance System: National panel study in the Republic of Korea. B BMC Health Serv Res. 2016;16(1):1-11.
7. Hoseini Shokoh SM. Types of moral hazard in health insurance marketing. J Educ Ethics Nurs. 2018;7(3):43-51. [In Persian].
8. Wong IOL, Lindner MJ, Cowling BJ, Lau EHY, Lo SV, Leung GM. Measuring moral hazard and adverse selection by propensity scoring in the mixed health care economy of Hong Kong. Health Policy. 2010;95(1): 24-35.
9. Ebrahimnia M, Khezri J, Teymourzadeh E, Amiri MM, Farzaneh A. Impact of deductibles on insured moral hazard in the armed forces health services: A case study in Tehran. J Mil Med. 2014;16(2):93-8. [In Persian].
10. OECD (2019), Health at a Glance 2019: OECD Indicators, OECD Publishing, Paris, https://doi.org/10.1787/4dd50c09-en.
11. Global spending on health: a world in transition. Geneva: World Health Organization; 2019(WHO/HIS/HGF/HFWorkingPaper/19.4). Licence: CC BY-NC-SA 3.0 IGO.
12. Schubert S. Reducing public health insurance expenditure: a numerical analysis for Germany. Appl Econ. 2014;46(19):2228-41.
13. Barati M, Azami F, Nagdi B, Foladi M, Hajimaghsoudi M, Asadi SA. Moral hazards in providing health services: A review of studies. Evid Based Health Policy Manag Econ. 2018;2(1):61-9.
14. Bazyar M, Soofi M, Rashidian A. Ways to control moral hazard in health system: demand-side and supply-side interventions. Tolooebehdasht. 2012;11(1):110-22. [In Persian].
15. Adrion ER, Ryan AM, Seltzer AC, Chen LM, Ayanian JZ, Nallamothu BK. Out-of-pocket spending for hospitalizations among nonelderly adults. JAMA Internal Med. 2016;176(9):1325-32.
16. Mirian I, Kabir MJ, Barati O, Keshavarz K, Bastani P. Deductibles in health insurance, beneficial or detrimental: A review article. Iran J Public Health. 2020; 49(5):851-9.
17. Qingyue M, Liying J, Beibei Y. Cost-sharing mechanisms in health insurance schemes: A systematic review. The Alliance for Health Policy and Systems Research, WHO. 2011:1-76.
18. Zhang H, Yuen PP. Medical Savings Account balance and outpatient utilization: Evidence from Guangzhou, China. Soc Sci Med. 2016;151:1-10.
19. Felder S. To wait or to pay for medical treatment? Restraining ex-post moral hazard in health insurance. J Health Econ. 2008;27(6):1418-22.
20. Benjiang M, Zhang Y, Qin Y, Bashir MF. Optimal insurance contract design with "No-claim Bonus and Coverage Upper Bound" under moral hazard. Expert Syst Appl. 2021;178:115050.
21. Fels M. Incentivizing efficient utilization without reducing access: The case against cost-sharing in insurance. Health Econ. 2020;29(7):827-40.
22. Dixon-Woods M, Cavers D, Agarwal S, Annandale E, Arthur A, Harvey J, et al. Conducting a critical interpretive synthesis of the literature on access to healthcare by vulnerable groups. BMC Med Res Methodol. 2006;6(1):1-13
23. Winkelmann R. Co-payments for prescription drugs and the demand for doctor visits - evidence from a natural experiment. Health Econ. 2004; 13(11):1081-9.
24. Yoo KB, Ahn HU, Park EC, Kim TH, Kim SJ, Kwon JA, et al. Impact of co-payment for outpatient utilization among Medical Aid beneficiaries in Korea: A 5-year time series study. Health Policy. 2016;120(8):960-6.
25. Kiil A, Houlberg K. How does copayment for health care services affect demand, health and redistribution? A systematic review of the empirical evidence from 1990 to 2011. Eur J Health Econ. 2014;15(8):813-28.
26. Huber CA, Ruesch P, Mielck A, Bocken J, Rosemann T, Meyer PC. Effects of cost sharing on seeking outpatient care: A propensity-matched study in germany and switzerland. J Eval Clin Pract. 2011;18(4):781-7.
27. Cockx B, Brasseur C. The demand for physician services: Evidence from a natural experiment. J Health Econ. 2003;22(6):881-913.
28. Hafner P, Mahlich JC. Determinants of physician's office visits and potential effects of co-payments: evidence from Austria. Int J Health Plann Manage. 2016; 31(3):e192-203.
29. Choi Y, Jae-Hyun K, Yoo KB, Cho KH, Jae-Woo C, Lee TH, et al. The effect of cost-sharing in private health insurance on the utilization of health care services between private insurance purchasers and non-purchasers: a study of the Korean health panel survey (2008-2012). BMC Health Serv Res. 2015; 15: 489.
30. Trottmann M, Zweifel P, Beck K. Supply-side and demand-side cost sharing in deregulated social health insurance: Which is more effective? J Health Econ. 2012; 31(1):231-42.
31. Landsem MM, Magnussen J. The effect of copayments on the utilization of the GP service in Norway. Soc Sci Med. 2018;205:99-106.
32. Fiorio CV, Siciliani L. Co-payments and the demand for pharmaceuticals: Evidence from Italy. Econ Model. 2010;27(4):835-41.
33. Petrou P. An interrupted time-series analysis to assess impact of introduction of co-payment on emergency room visits in Cyprus. Appl Health Econ Health Police. 2015;13(5):515-23.
34. Sabik LM, Gandhi SO. Copayments and emergency department use among adult Medicaid enrollees. Health Econ. 2016; 25(5):529-42.
35. Law CK, Yip PS. Acute care service utilisation and the possible impacts of a user-fee policy in Hong Kong. Hong Kong Med J. 2002;8(5):348-53.
36. Kan M, Suzuki W. Effects of cost sharing on the demand for physician services in Japan: Evidence from a natural experiment. Jpn World Econ. 2010; 22(1):1-12.
37. Serna N. Cost sharing and the demand for health services in a regulated market. Health Econ. 2021;30(6):1259-75.
38. Gerfin M, Schellhorn M. Nonparametric bounds on the effect of deductibles in health care insurance on doctor visits - Swiss evidence. Health Econ. 2006;15(9):1011-20.
39. Jakobsson N, Svensson M. Copayments and physicians visits: A panel data study of Swedish regions 2003-2012. Health Policy. 2016;120(9):1095-9.
40. Jakobsson N, Svensson M. The effect of copayments on primary care utilization: results from a quasi-experiment. Appl Econ. 2016;48(39):3752-62.
41. Schreyögg J, Grabka MM. Copayments for ambulatory care in Germany: a natural experiment using a difference-in-difference approach. Eur J Health Econ. 2010;11(3):331-41.
42. Mortensen K. Copayments did not reduce medicaid enrollees' nonemergency use of emergency departments. Health Aff. 2010;29(9):1643-50.
43. Bardey D, Lesur R. Optimal health insurance contract: Is a deductible useful? Econ Lett. 2005;87(3):313-7.
44. Bakx P, Chernichovsky D, Paolucci F, Schokkaert E, Trottmann M, Wasem J, et al. Demand-side strategies to deal with moral hazard in public insurance for long-term care. J Health Serv Res Policy. 2015;20(3):170-6.
45. Agarwal R, Mazurenko O, Menachemi N. High-deductible health plans reduce health care cost and utilization, including use of needed preventive services. Health Aff. 2017;36(10):1762-8.
46. Kim J, Ko S, Yang B. The effects of patient cost sharing on ambulatory utilization in South Korea. Health policy. 2005;72(3):293-300.
47. Abdus S. The role of plan choice in health care utilization of high-deductible plan enrollees. Health Serv Res. 2020; 55(1):119-27.

[DOI: 10.47176/mjiri.36.69]

48. Rabin DL, Jetty A, Petterson S, Froehlich A. Under the aca higher deductibles and medical debt cause those most vulnerable to defer needed care. J Health Care Poor Underserved. 2020;31(1):424-40.
49. Kullgren JT, Volpp KG, Polsky D. Are the healthy behaviors of US high-deductible health plan enrollees driven by people who chose these plans? Smoking as a case study. PloS one. 2013;8(2):e56154.
50. Reddy SR, Ross-Degnan D, Zaslavsky AM, Soumerai SB, Wharam JF. Impact of a high-deductible health plan on outpatient visits and associated diagnostic tests. Med Care. 2014;52(1):86.
51. Schellhorn M. The effect of variable health insurance deductibles on the demand for physician visits. Health Econ. 2001;10(5):441-56.
52. Law MR, Cheng L, Worthington H, Mamdani M, McGrail KM, Chan FK, et al. Impact of income-based deductibles on drug use and health care utilization among older adults. CMAJ. 2017;189(19):E690-E6.
53. Ponzo M, Scoppa V. Does demand for health services depend on cost-sharing? Evidence from Italy. Econ Model. 2021;103:105599.
54. Buntin MB, Haviland AM, McDevitt R, Sood N. Healthcare Spending and Preventive Care in High-Deductible and Consumer-Directed Health Plans. Am J Manag Care. 2011; 17(3):222-30.
55. Lin H, Sacks DW. Intertemporal substitution in health care demand: Evidence from the rand health insurance experiment. J Public Econ. 2019; 175:29 –43.
56. Frank MB, Fendrick AM, He Y, Zbrozek A, Holtz N, Leung S, et al. The effect of a large regional health plan's value-based insurance design program on statin use. Med Care. 2012; 50(11):934-9.
57. Cattel D, van Kleef RC, van Vliet R. A method to simulate incentives for cost containment under various cost sharing designs: An application to a first-euro deductible and a doughnut hole. Eur J Health Econ. 2017;18(8):987-1000.
58. Drevs F, Tscheulin DK. The effect of framing on the choice of co-payment policies, reducing moral hazard and post-choice-evaluation. J Bus Econ. 2013;83(3):213-33.
59. Ferguson W, White BS, McNair J, Miller C, Wang B, Coustasse A. Potential savings from consumer-driven health plans. Int J Healthc Manage. 2020.
60. van Kleef RC, van de Ven W, van Vliet R. Shifted deductibles for high risks: More effective in reducing moral hazard than traditional deductibles. J Health Econ. 2009;28(1):198-209.
61. Pütz C, Hagist C. Optional deductibles in social health insurance systems: Findings from germany. Eur J Health Econ. 2006;7(4):225-30.
62. van Winssen KP, van Kleef RC, van de Ven WP. How profitable is a voluntary deductible in health insurance for the consumer? Health Policy. 2015;119(5):688-95.
63. Herr A, Suppliet M. Tiered co-payments, pricing, and demand in reference price markets for pharmaceuticals. J Health Econ. 2017;56:19-29.
64. Chernew ME, Encinosa WE, Hirth RA. Optimal health insurance: The case of observable, severe illness. J Health Econ. 2000;19(5):585-60.
65. Koc C. Disease-Specific Moral Hazard and Optimal Health Insurance Design for Physician Services. J Risk Insur. 2011;78(2):413-46.
66. Pauly MV, Blavin FE. Moral hazard in insurance, value-based cost sharing, and the benefits of blissful ignorance. J Health Econ. 2008;27(6):1407-17.
67. Chen T. Can Health Savings Accounts Reduce Health Spending? Evidence from China. Front Econ China. 2021;16(1):105-23.
68. Steinorth P. Impact of health savings accounts on precautionary savings, demand for health insurance and prevention effort. J Health Econ. 2011;30(2):458-65.
69. Fan MY, Lei Z, Liu G. Discounting of medical savings accounts. Am J Health Econ. 2016;2(2):161-83.
70. Gravelle H, Siciliani L. Optimal quality, waits and charges in health insurance. J Health Econ. 2008;27(3):663-74.
71. Olivella P. Shifting public-health-sector waiting lists to the private sector. Eur J Polit Econ. 2003;19(1):103-32.
72. Hoel M, Sæther EM. Public health care with waiting time: the role of supplementary private health care. J Health Econ. 2003; 22(4):599-616.
73. Thönnes S. Ex-post moral hazard in the health insurance market: empirical evidence from German data. Eur J Health Econ. 2019;20(9):1317-33.
74. Ullrich CG. Managing the behavior of the medically insured in germany: The acceptance of cost-sharing and risk premiums by members of the statutory health insurance. J Health Soc Policy. 2002;15(1):31-43.
75. Wu Y, Bardey D, Chen Y, Li S. Health care insurance policies When the provider and patient may collude. Health Econ. 2021;30(3):525-43.
76. Geyman JP. Cost-sharing under consumer-driven health care will not reform u.S. Health care. J Law Med Ethics. 2012; 40(3):574-81.

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Appendix 1. Search strategy

Databases	Search strategy
PubMed	(“moral hazard”[tiab] OR “moral hazards”[tiab] OR “principal agency problem”[tiab] OR “principal agent dilemma”[tiab] OR “principal agent problem”[tiab] OR “unnecessary use”[tiab] OR “unnecessary utilization”[tiab] OR “non-essential use”[tiab] OR “non essential utilization”[tiab] OR overutilization[tiab] OR overutilizations[tiab] OR overutilization[tiab] OR overutilisations[tiab] OR “over-utilization”[tiab] OR “over-utilizations”[tiab] OR “over-utilisation”[tiab] OR “over-utilisations”[tiab]) AND (“Delivery of Healthcare”[tiab] OR “Healthcare Deliveries”[tiab] OR “Healthcare Delivery”[tiab] OR (Deliveries[tiab] AND Healthcare[tiab]) OR (Delivery[tiab] AND Healthcare[tiab]) OR “Health Care Delivery”[tiab] OR (Delivery[tiab] AND “Health Care”[tiab]) OR “Health Care”[tiab] OR (Care[tiab] AND Health[tiab]) OR Healthcare[tiab] OR “Health Care Systems”[tiab] OR “Health Care System”[tiab] OR (System[tiab] AND “Health Care”[tiab]) OR (Systems[tiab] AND “Health Care”[tiab]) OR “Healthcare Systems”[tiab] OR “Healthcare System”[tiab] OR (System[tiab] AND Healthcare[tiab]) OR (Systems[tiab] AND Healthcare[tiab]) OR “Community-Based Distribution”[tiab] OR “Community Based Distribution”[tiab] OR “Community-Based Distributions”[tiab] OR (Distribution[tiab] AND “Community-Based”[tiab]) OR (Distributions[tiab] AND “Community-Based”[tiab]) OR “health system”[tiab] OR “long stay care”[tiab] OR “long term care”[tiab] OR “health insurance”[tiab] OR “health service”[tiab] OR “health services"[tiab] OR “medical care“[tiab] OR “medical service”[tiab] OR “medical services”[tiab] OR drug[tiab] OR medication[tiab] OR outpatient[tiab] OR "physician visit"[tiab] OR "outpatient visit"[tiab] OR inpatient[tiab] OR hospitalization[tiab] OR hospitalization[tiab] OR “hospital admission”[tiab] OR “hospital care”[tiab])
Embase	(“moral hazard”:ti,ab OR “moral hazards”:ti,ab OR “principal agency problem”:ti,ab OR “principal agent dilemma”:ti,ab OR “principal agent problem”:ti,ab OR “unnecessary use”:ti,ab OR “unnecessary utilization”:ti,ab OR “non-essential use”:ti,ab OR “non essential utilization”:ti,ab OR overutilization:ti,ab OR overutilizations:ti,ab OR overutilization:ti,ab OR overutilisations:ti,ab OR “over-utilization”:ti,ab OR “over-utilizations”:ti,ab OR “over-utilisation”:ti,ab OR “over-utilisations”:ti,ab) AND (“Delivery of Healthcare”:ti,ab OR “Healthcare Deliveries”:ti,ab OR “Healthcare Delivery”:ti,ab OR (Deliveries:ti,ab AND Healthcare:ti,ab) OR (Delivery:ti,ab AND Healthcare:ti,ab) OR “Health Care Delivery”:ti,ab OR (Delivery:ti,ab AND “Health Care”:ti,ab) OR “Health Care”:ti,ab OR (Care:ti,ab AND Health:ti,ab) OR Healthcare:ti,ab OR “Health Care Systems”:ti,ab OR “Health Care System”:ti,ab OR (System:ti,ab AND “Health Care”:ti,ab) OR (Systems:ti,ab AND “Health Care”:ti,ab) OR “Healthcare Systems”:ti,ab OR “Healthcare System”:ti,ab OR (System:ti,ab AND Healthcare:ti,ab) OR (Systems:ti,ab AND Healthcare:ti,ab) OR “Community-Based Distribution”:ti,ab OR “Community Based Distribution”:ti,ab OR “Community-Based Distributions”:ti,ab OR (Distribution:ti,ab AND “Community-Based”:ti,ab) OR (Distributions:ti,ab AND “Community-Based”:ti,ab) OR “health system”:ti,ab OR “long stay care”:ti,ab OR “long term care”:ti,ab OR “health insurance”:ti,ab OR “health service”:ti,ab OR “health services":ti,ab OR “medical care“:ti,ab OR “medical service”:ti,ab OR “medical services”:ti,ab OR drug:ti,ab OR medication:ti,ab OR outpatient:ti,ab OR "physician visit":ti,ab OR "outpatient visit":ti,ab OR inpatient:ti,ab OR hospitalization:ti,ab OR hospitalization:ti,ab OR “hospital admission”:ti,ab OR “hospital care”:ti,ab)
Scopus	(TITLE-ABS-KEY(“moral hazard”) OR TITLE-ABS-KEY(“moral hazards”) OR TITLE-ABS-KEY(“principal agency problem”) OR TITLE-ABS-KEY(“principal agent dilemma”) OR TITLE-ABS-KEY(“principal agent problem”) OR TITLE-ABS-KEY(“unnecessary use”) OR TITLE-ABS-KEY(“unnecessary utilization”) OR TITLE-ABS-KEY(“non-essential use”) OR TITLE-ABS-KEY(“non essential utilization”) OR TITLE-ABS-KEY(overutilization) OR TITLE-ABS-KEY(overutilizations) OR TITLE-ABS-KEY(overutilization) OR TITLE-ABS-KEY(overutilisations) OR TITLE-ABS-KEY(“over-utilization”) OR TITLE-ABS-KEY(“over-utilizations”) OR TITLE-ABS-KEY(“over-utilisation”) OR TITLE-ABS-KEY(“over-utilisations”)) AND (TITLE-ABS-KEY(“Delivery of Healthcare”) OR TITLE-ABS-KEY(“Healthcare Deliveries”) OR TITLE-ABS-KEY(“Healthcare Delivery”) OR (TITLE-ABS-KEY(Deliveries) AND TITLE-ABS-KEY(Healthcare)) OR (TITLE-ABS-KEY(Delivery) AND TITLE-ABS-KEY(Healthcare)) OR TITLE-ABS-KEY(“Health Care Delivery”) OR (TITLE-ABS-KEY(Delivery) AND TITLE-ABS-KEY(“Health Care”)) OR TITLE-ABS-KEY(“Health Care”) OR (TITLE-ABS-KEY(Care) AND TITLE-ABS-KEY(Health)) OR TITLE-ABS-KEY(Healthcare) OR TITLE-ABS-KEY(“Health Care Systems”) OR TITLE-ABS-KEY(“Health Care System”) OR (TITLE-ABS-KEY(System) AND TITLE-ABS-KEY(“Health Care”)) OR (TITLE-ABS-KEY(Systems) AND TITLE-ABS-KEY(“Health Care”)) OR TITLE-ABS-KEY(“Healthcare Systems”) OR TITLE-ABS-KEY(“Healthcare System”) OR (TITLE-ABS-KEY(System) AND TITLE-ABS-KEY(Healthcare)) OR (TITLE-ABS-KEY(Systems) AND TITLE-ABS-KEY(Healthcare)) OR TITLE-ABS-KEY(“Community-Based Distribution”) OR TITLE-ABS-KEY(“Community Based Distribution”) OR TITLE-ABS-KEY(“Community-Based Distributions”) OR (TITLE-ABS-KEY(Distribution) AND TITLE-ABS-KEY(“Community-Based”)) OR (TITLE-ABS-KEY(Distributions) AND TITLE-ABS-KEY(“Community-Based”)) OR TITLE-ABS-KEY(“health system”) OR TITLE-ABS-KEY(“long stay care”) OR TITLE-ABS-KEY(“long term care”) OR TITLE-ABS-KEY(“health insurance”) OR TITLE-ABS-KEY(“health service”) OR TITLE-ABS-KEY(“health services") OR TITLE-ABS-KEY(“medical care“) OR TITLE-ABS-KEY(“medical service”) OR TITLE-ABS-KEY(“medical services”) OR TITLE-ABS-KEY(drug) OR TITLE-ABS-KEY(medication) OR TITLE-ABS-KEY(outpatient) OR TITLE-ABS-KEY("physician visit") OR TITLE-ABS-KEY("outpatient visit") OR TITLE-ABS-KEY(inpatient) OR TITLE-ABS-KEY(hospitalization) OR TITLE-ABS-KEY(hospitalization) OR TITLE-ABS-KEY(“hospital admission”) OR TITLE-ABS-KEY(“hospital care”))
Web of Science	(TS=(“moral hazard”) OR TS=(“moral hazards”) OR TS=(“principal agency problem”) OR TS=(“principal agent dilemma”) OR TS=(“principal agent problem”) OR TS=(“unnecessary use”) OR TS=(“unnecessary utilization”) OR TS=(“non-essential use”) OR TS=(“non essential utilization”) OR TS=(overutilization) OR TS=(overutilizations) OR TS=(overutilization) OR TS=(overutilisations) OR TS=(“over-utilization”) OR TS=(“over-utilizations”) OR TS=(“over-utilisation”) OR TS=(“over-utilisations”)) AND (TS=(“Delivery of Healthcare”) OR TS=(“Healthcare Deliveries”) OR TS=(“Healthcare Delivery”) OR (TS=(Deliveries) AND TS=(Healthcare)) OR (TS=(Delivery) AND TS=(Healthcare)) OR TS=(“Health Care Delivery”) OR (TS=(Delivery) AND TS=(“Health Care”)) OR TS=(“Health Care”) OR (TS=(Care) AND TS=(Health)) OR TS=(Healthcare) OR TS=(“Health Care Systems”) OR TS=(“Health Care System”) OR (TS=(System) AND TS=(“Health Care”)) OR (TS=(Systems) AND TS=(“Health Care”)) OR TS=(“Healthcare Systems”) OR TS=(“Healthcare System”) OR (TS=(System) AND TS=(Healthcare)) OR (TS=(Systems) AND TS=(Healthcare)) OR TS=(“Community-Based Distribution”) OR TS=(“Community Based Distribution”) OR TS=(“Community-Based Distributions”) OR (TS=(Distribution) AND TS=(“Community-Based”)) OR (TS=(Distributions) AND TS=(“Community-Based”)) OR TS=(“health system”) OR TS=(“long stay care”) OR TS=(“long term care”) OR TS=(“health insurance”) OR TS=(“health service”) OR TS=(“health services”) OR TS=(“medical care“) OR TS=(“medical service”) OR TS=(“medical services”) OR TS=(drug) OR TS=(medication) OR TS=(outpatient) OR TS=("physician visit") OR TS=("outpatient visit") OR TS=(inpatient) OR TS=(hospitalization) OR TS=(hospitalization) OR TS=(“hospital admission”) OR TS=(“hospital care”))
ProQuest	TI,AB,SU(“moral hazard” OR “moral hazards” OR “principal agency problem” OR “principal agent dilemma” OR “principal agent problem” OR “unnecessary use” OR “unnecessary utilization” OR “non-essential use” OR “non essential utilization” OR overutilization OR overutilizations OR overutilization OR overutilisations OR “over-utilization” OR “over-utilizations” OR “over-utilisation” OR “over-utilisations”) AND TI,AB,SU(“Delivery of Healthcare” OR “Healthcare Deliveries” OR “Healthcare Delivery” OR (Deliveries AND Healthcare) OR (Delivery AND Healthcare) OR “Health Care Delivery” OR (Delivery AND “Health Care”) OR “Health Care” OR (Care AND Health) OR Healthcare OR “Health Care Systems” OR “Health Care System” OR (System AND “Health Care”) OR (Systems AND “Health Care”) OR “Healthcare Systems” OR “Healthcare System” OR (System AND Healthcare) OR (Systems AND Healthcare) OR “Community-Based Distribution” OR “Community Based Distribution” OR “Community-Based Distributions” OR (Distribution AND “Community-Based”) OR (Distributions AND “Community-Based”) OR “health system” OR “long stay care” OR “long term care” OR “health insurance” OR “health service” OR “health services" OR “medical care“ OR “medical service” OR “medical services” OR drug OR medication OR outpatient OR "physician visit" OR "outpatient visit" OR inpatient OR hospitalization OR hospitalization OR “hospital admission” OR “hospital care”)

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Appendix 2. The general characteristics of the included studies

Author/ year /source	Country/ language	Approach &Design	Demand side intervention	Analyzed outcome	Quality appraisal score (out of 10)
Abdus S. 2020 (47)	USA/ English	Quantitative: Cross sectional	High-deductible health plan (HDHPs), consumer-directed health plans (CDHPs), low-deductible health plans (LDHPs), no-deductible health plans (NDHPs).	health care utilization: ambulatory visit, specialist visit, preventive services	10
Alessie RJM, et al 2020 (5)	Netherlands /English	Quantitative: longitudinal Internet Studies	voluntary deductible with premium reduction/ rebate	moral hazard (GP visits, medical specialist visits, number of days spent in a hospital, number of visits to mental health care	9
Agarwal R, et al 2017(45)	USA/ English	systematic review	high-deductible health plans (HDHPs)	health care utilization and health care costs	9
Bakx P et al 2015 (44)	Germany, Belgium, Switzerland, Netherlands	Comparative study	Cost sharing: Copayments& deductibles -Managed competition: Financial risk and risk adjustment	Effect on access Effect on efficiency	8
Bardey D & Lesur R. 2005 (43)	France/ English	theoretical approach based on model formulation	Deductible	Optimal health insurance contract	6
Beeuwkes Buntin M, et al 2011 (54)	USA/ English	Quantitative: Retrospective difference-in difference	high deductible health plans (HDHPs) & consumer directed health plans (CDHPs)	Healthcare spending and use of recommended preventive care	8
Benjiang M, et al. 2021 (20)	China / English	theoretical approach based on model formulation	No-claim Bonus and Coverage Upper Bound	risk-reducing effort and utility	8
Cattel D, et al. 2017 (57)	Netherlands / English	Quantitative: developing a simulation model	different deductible modalities*:* first-euro deductible and doughnut hole deductible	cost containment incentives (CCI)	7
Chen T. 2021 (67)	China/ English	Quantitative: Empirically design	health savings accounts (HSAs)	medical expenses and moral hazard	8
Chernew ME, et al 2000 (64)	USA/ English	theoretical approach based on model formulation	optimal cost sharing provisions /Treatment-specific copayments	optimal insurance contracts	7
Choi Y, et al. 2015 (29)	Korean/ English	Quantitative: panel survey	Introduction cost sharing in private health insurance (PHI	outpatient visits, inpatient visits, length of stay in hospital	9
Cockx & Brasseur C. 2003 (27)	Belgium/ English	Quantitative: natural experiment /differences-in differences (DD) estimator	To increase copayment rates of three types of physician services	(GPs) visits, home visits, specialist visits and efficiency	8
Drevs F & Tscheulin.dk. 2013 (58)	Germany/ English	Quantitative: Two experimental studies	co-payment with a rebate frame -co-payment with a premium reduction frame	ex-post moral hazard	9
Ebrahimnia M, et al 2014 (9)	Iran/ Persian	Quantitative: Cross sectional	coinsurance	Outpatient services Inpatient services and medication	8
Fan M et al 2016 (69)	China English	Quantitative: a quasi-natural experiment/ DID	reduced MSA funds	health-care expenditures	10
Felder S 2008 (19)	Germany/ English	theoretical approach based on model formulation	queuing as a rationing device waiting time and coinsurance	Optimal insurance contracts	8
Fels M Health. 2020 (21)	Germany/ English	theoretical approach based on model formulation	cost sharing and bonus payments/ rebates insurance	access to efficient care	8
Ferguson W, et al. 2020 (59)	USA/ English	Review article	Consumer-Driven Health Plans/ Consumer engagement/ three-tier payment system	financial savings & transparency of healthcare cost.	6
Fiorio CV& Siciliani L 2010 (32)	Italy/ English	Quantitative: natural experiment/ difference-in-difference	To Increase copayment	per capita number of prescriptions per capita public pharmaceutical expenditure	9
Frank MB, et al. 2012 (56)	USA/ English	Quantitative: econometric model with a difference-in-difference design	Value-based Insurance Design Copayments on VBID brand statins	medication adherence (medication possession)	9
Gerfin M & Schellhorn M. 2006 (38)	Switzerland/English	Quantitative: Cross- sectional	Different size of deductibles	the probability of going to the doctor	8

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Appendix 2. Continued

Author/ year /source	Country/ language	Approach &Design	Demand side intervention	Analyzed outcome	Quality appraisal score (out of 10)
Gravelle H& Siciliani L 2008 (70)	United Kingdom / English	theoretical approach based on model formulation	waiting time	Optimal quality	8
Hafner P& Mahlich JC. 2015 (28)	Austria/ English	Quantitative: survey data	hypothetical co-payments in the range of €5 to €200	average annual numbers of physician's office visits	9
Herr A & Suppliet M 2017 (63)	Germany/ English	Quantitative: econometric model with a difference-in-difference design	price-related co-payment tiers/ exempt from co-payments	Decreasing drug prices and demand	8
Hoel M& Sæther EM 2003 (72)	Norway English	theoretical approach based on model formulation	waiting time	cost of public health	7
Huber CA, et al 2012 (26)	Germany, Switzerland, English	Quantitative: cross-sectional	introduction of (additional) cost-sharing	visits to a general practitioner or a specialist during the past 12 months & socio-demographic factors	9
Jakobsson N & Svensson M. 2016 (39)	Sweden/ English	Quantitative: panel data model	variation of copayments per primary care physician visit	the number of visits per capita per year	9
Jakobsson N & Svensson M. 2016 (40)	Sweden/ English	Quantitative: quasi-experimental approaches	price reform/ co-payments in a tax-financed health-care system	number of daily visits, socio-economic/demographic	9
Kan M & Suzuki W 2010 (36)	Japan/ English	Quantitative: natural experiment	cost sharing: increase in the coinsurance rate	Number of physician visits & expenditure per visit	9
Kiil A & Houlberg K. 2014 (25)	Denmark/ English	Review article	copayment	demand effects: prescription medicine, consultations with general practitioners and specialists, ambulatory care and, prevalence of hospitalization	9
Kim J et al 2005 (46)	South Korea/ English	Quantitative: Observational continuous survey performed every 3 years	To increase cost sharing	demand for physician service and price elasticities	9
Koc C 2011 (65)	USA/ English	Quantitative: Generalized Method of Moments (GMM)	differential cost sharing based on disease status	optimal insurance for physician services	9
Kullgren JT 2013 (49)	USA/ English	Quantitative: Cross-sectional analysis of nationally-representative data	high-deductible health plan (HDHP)	Self-reported smoking status	9
Landsem MM & Magnussen J. 2018 (31)	Norway/ English	Quantitative: experimental design	introduction of a co-payment	total utilization of the GPs service and this effect varies across different patient groups	10
Law CK& Yip PS. 2002 (35)	Hong Kong/ English	Quantitative: Retrospective study (scenario	user-fee policy	non-emergency attendances in Hong Kong	9
Law MR, et al 2017 (52)	Canada/ English	Quantitative: quasi-experimental	The income-based deductible	Drug and health care utilization and cost among older adults.	9
Lin H, Sacks DW. 2019 (55)	USA/ English	Quantitative: Econometric approach	nonlinear cost-sharing(high deductible health plan	health care demand	10
Mirian I et al 2020 (16)	Iran/ English	review article	Deductible	Impacts on utilization of the insured -Financial impacts on the insured-Financial impacts on health insurance organization	8

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Appendix 2. Continued

Author/ year /source	Country/ language	Approach &Design	Demand side intervention	Analyzed outcome	Quality appraisal score (out of 10)
Mortensen K 2010 (42)	USA/ English	Quantitative: Quasi experimental, (difference-in-differences)	Copayments	nonemergency visits in emergency departments	9
Olivella P 2003 (71)	Spain English	theoretical approach based on model formulation	Waiting lists the public health administration's (PbHA's) decisions on waiting lists for public treatments.	incentives to reduce waiting lists	7
Pauly MV& Blavin FE 2008 (66)	USA/ English	theoretical approach based on model formulation	Value based cost sharing	Optimal insurance	6
Petrou P 2015 (33)	Cyprus/ English	Quantitative: interrupted time-series (ITS) analysis	introduction of co-payment fee of EUR10	Emergency room services	9
Ponzo M & Scoppa 2021 (53)	Italy/ English	Quantitative: experimental design	exemption from cost-sharing	demand for specialist visits, diagnostic checks and drug consumption	10
Pütz C& Hagist C 2006 (61)	Germany/ English	Quantitative: trial scheme	bonus of €240 per year plus to pay a deductible for their medical treatment of up to €300.	- the principles of solidarity; -insurance claims	8
Rabin et al 2020 (48)	USA/ English	Quantitative: cross- sectional survey	Deductibles increased in employer- provided insurance, combine HRAs with HDHPs.	medical debt, deferred needed care	10
Reddy SR, et al (2014) (50)	USA/ English	Quantitative: pre-post with comparison group study design	High-Deductible Health Plan (HDHP)	Outpatient Visits and Associated Diagnostic Tests: laboratory and radiology tests	8
Sabik LM & Gandhi SO. 2016 (34)	USA/ English	Quantitative: Quasi experimental design	changes in Medicaid ED copayment policies (increase copayment)	Non urgent Emergency department ED utilization among nonelderly adult enrollees	8
Schellhorn M. (2001) (51)	Swiss/ English	Quantitative: A generalized method of moments (GMM) estimator	introduction of a choice of deductible for health services in the mandatory basic health insurance	Physician service utilization.	8
Schreyogg J& Grabka MM 2010 (41)	Germany/ English	Quantitative: natural experiment difference-in-difference approach	introduction copayment for ambulatory care in 2004 for individuals with statutory health insurance	overall demand for physician visits	10
Schubert S. 2014 (12)	Germany/ English	Quantitative: numerical analysis/GEM	mandatory deductibles and further elevating copayments	health care demand and health care expenditure	7
Serna N. 2021 (37)	USA/ English	Quantitative: experimental design	tier coinsurance and income base copays	utilization of health services	10
Steinorth P J 2011 (68)	Germany/ English	theoretical approach based on model formulation	health savings accounts with tax subsidy	optimal savings, insurance demand and prevention effort over the course of a lifetime	8
Thönnes S 2019 (73)	Germany/ English	Quantitative: panel data	premium refunds	different measures of medical demand	10
Trottmann M, et al 2012 (30)	Switzerland/ English	Quantitative: panel dataset	Supply-side cost sharing and demand-side cost sharing (through voluntary deductibles)	use of medical services	10
Ullrich CG 2002 (74)	Germany /English	qualitative guided interviews	cost-sharing and risk premiums	social acceptance of cost-sharing and risk premiums by members of the German statutory health insurance.	8
van Kleef RC, et al 2009 (60)	Netherlands/ English	Quantitative: empirical illustration	Shifted Deductibles	moral hazard & out-of-pocket expenditures	9
van Winssen KP 2015 (62)	Netherlands/ English	Quantitative: empirical Statistical analyses	voluntary deductible (VD) in return for a premium rebate.	financial profitability	9
Yaping Wu , et al 2021 (75)	China/ English	theoretical approach based on model formulation	Patient incentive (risk premium) versus provider incentive	Physician-patient collusion and health costs	8
Winkelmann R 2004 (23)	Germany/ English	Quantitative: natural experiment / differences-in-differences estimates	To increase co-payments for prescription drugs	price sensitivity of demand for physicians' services	9
Yoo KB, et al 2016 (24)	Korea/ English g	time series study/ statistic regression analysis	introduction of out- patient co-payment scheme.	medical cost, out patients and inpatients visits	9
Zhang H & Yuen P 2016 (18)	China/ English	Quantitative: Econometric model	Medical Savings Account balance	outpatient utilization	10

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