Submitted : 25 April 2025
Revised : 02 Januari 2026
Accepted : 21 Mei 2026
Published : 30 Juli 2026

*Generics: Journal of Research in Pharmacy*
*6(2), Tahun 2026*
*e-ISSN: 2774-9967*

# ACCEPTANCE, WILLINGNESS TO PAY, AND INFLUENCE FACTORS FOR CARDIOVASCULAR DISEASE SCREENING: A SYSTEMATIC REVIEW

*Penerimaan, Kesediaan Membayar, dan Faktor yang Memengaruhi pada Skrining Penyakit Kardiovaskular: Sistematik Review*

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## ABSTRAK

Penyakit kardiovaskular menempati peringkat tertinggi sebagai beban ekonomi, tetapi banyak individu yang belum terdiagnosis akibat tidak adanya program skrining yang terstruktur atau kurangnya pengobatan pada tahap awal. *Willingness to Pay* (WTP) atau Kesediaan Membayar merupakan metode yang digunakan untuk menilai preferensi konsumen terhadap suatu produk atau layanan dengan mengevaluasi kemampuan dan kesediaan finansial dalam suatu populasi tertentu. Tinjauan sistematis ini bertujuan untuk mengkaji studi mengenai penerimaan, kesediaan membayar (*willingness to pay*), serta faktor-faktor yang memengaruhi skrining penyakit kardiovaskular. Artikel dikumpulkan dengan menelusuri kata kunci yang relevan pada basis data PubMed, Scopus, dan Google Scholar. Tinjauan sistematis ini dilakukan berdasarkan metode PRISMA. Sebanyak 7 artikel disertakan dalam tinjauan ini. Sebagian besar partisipan berusia di atas 55 tahun, dan 50% di antaranya terdiagnosis hipertensi tahap awal. Kisaran kesediaan membayar untuk tes skrining tahunan adalah antara US$10-500. Hasil dari semua studi yang ditinjau menunjukkan penerimaan yang cukup tinggi terhadap skrining penyakit kardiovaskuler. Riwayat keluarga dan persepsi terhadap risiko merupakan faktor yang paling berpengaruh selain biaya. Temuan ini dapat menjadi referensi bagi para pembuat kebijakan dalam mengimplementasikan intervensi kesehatan masyarakat yang efektif. Dengan mengembangkan dan mempromosikan program skrining, pemerintah dapat meningkatkan upaya pencegahan untuk menurunkan angka morbiditas dan mortalitas akibat Penyakit Kardiovaskuler.

**Kata kunci:** *skrining penyakit kronis, persepsi risiko, pencegahan primer, faktor penyakit kardiovaskuler, kesadaran kesehatan*.

## ABSTRACT

Cardiovascular Disease (CVD) ranks as the highest economic burden; many individuals remain undiagnosed due to the absence of a structured screening program or lack of early-stage treatment. Willingness to Pay (WTP) is a method used to assess consumers' preference for a product or service by evaluating their financial capacity and willingness to pay within a given population. This systematic review aimed to examine studies of WTP and factors influencing CVD screening. The required articles were collected by searching for relevant keywords in PubMed, Scopus, and Google Scholar. This systematic review was conducted using the PRISMA method. Seven studies were included in the review. Most participants were aged above 55 years, and 50% were diagnosed with early-stage hypertension. The WTP ranged from US$ 10 to US$

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500 per annual screening test. The results of reviewed studies indicate a relatively high level of acceptance for CVD screening. Family history and perception of risk are the most significant factors, besides cost. These findings can serve as a valuable reference for policymakers in implementing effective public health interventions. By developing and promoting screening programs, governments can enhance preventive measures to reduce the morbidity and mortality associated with CVD.

**Keywords:** *cardiovascular disease screening, knowledge, acceptance, primary prevention, willingness to pay, health awareness.*

## INTRODUCTION

Heart attacks are caused by cardiovascular disease (CVD), a non-communicable illness that is the leading cause of mortality worldwide (17.9 million deaths per year) (Olvera *et al*., 2024). A growing population, aging, and the contribution from preventable metabolic, environmental, and behavioral risks increased the global death rate due to CVD from 12.4 million in 1990 to 19.8 million in 2022 (Vaduganathan *et al.*, 2022). In Indonesia, cardiovascular disease has been the cause of 37% of all deaths (WHO, 2021).

The primary cause of cardiovascular disease is hypertension, which is followed by diabetes and coronary heart disease (Turana, *et al*., 2020). Cardiovascular Disease refers to a group of conditions that affect the heart and blood vessels (Teo *et al*., 2021).

It is important to prioritize research and preventive cardiovascular disease strategies to address this global health crisis (Khan *et al.*, 2020). The shift from physically demanding to sedentary jobs during the industrialization era, coupled with a culture driven by consumerism and technology that encourages long work hours, lengthy commutes, and a sedentary lifestyle, may explain the rise in cardiovascular disease over the past few decades(Olvera *et al*., 2024).

CVD screening involves various tests aimed at detecting risk factors that contribute to conditions such as coronary artery disease, heart attack, and or stroke (Engdahl *et al.*, 2018). Common screening tests include body mass index (BMI) measurement, blood pressure assessment, blood glucose testing, lipid profile analysis, and electrocardiogram (ECG), which is considered the most effective method for identifying individuals at high or low risk (Yang *et al.*, 2024). Risk classification plays a crucial role in determining appropriate preventive interventions for each individual (Gooding *et al.*, 2020).

Therefore, regular screening, at least once a year, is recommended for both individuals with or without CVD risk factors (Curry *et al.*, 2018). This recommendation is crucial, as CVD patients remain asymptomatic until they experience a heart attack and require hospitalization (Saab *et al.*, 2009).

The success of the screening program largely depends on public acceptance, which is influenced by several factors, including sociodemographic characteristics and screening cost.

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"Willingness to Pay" (WTP) is a method used to determine a consumer's preference for a product or service by assessing their ability to pay within a given population (Steigenberger *et al.*, 2022).

This study aimed to systematically review factors influencing WTP and willingness to pay (WTP) for cardiovascular disease as individual screening or in a package, including cardiovascular disease management care and service. This review is essential for evidence-based decision-making and strategic planning to integrate cardiovascular disease screening into government programs aimed at stroke prevention in Indonesia.

## METHOD

### Search Strategy and Selection Criteria

This systematic review was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline. All references used in this systematic review were managed using Mendeley Reference Manager. A systematic search of electronic databases, including PubMed, Scopus, and Google Scholar, was conducted to identify relevant, full-text studies with English-only content from the inception of each database until December 2024. The MeSH term ("Cardiovascular Diseases"[MeSH]) AND ("Mass Screening"[MeSH] OR "Preventive Health Services"[MeSH]) AND ("Patient Acceptance of Health Care"[MeSH] OR "Health Knowledge, Attitudes, Practice"[MeSH]) AND ("Costs and Cost Analysis"[MeSH] OR "Health Care Costs"[MeSH] OR willingness to pay) and Boolean operators are used to systematically search for the keywords “Willingness to Pay” AND “Cardiovascular” AND “Screening” OR “detection”.

Studies were included if they were published in English, assessed WTP for cardiovascular disease screening among adults, and were available as full-text articles. A publication that does not address the subject’s WTP for screening or detection is excluded.

### Study Quality Assessment

The reviewer evaluated the study quality assessment used to assess the article using JBI critical appraisal for a cross-sectional study. The checklist option contains “Yes”, “No”, and “Unclear”. Another step to review the article was maintained using the Mendeley software to record duplicates, the abstract and article discovered were reviewed by 2 authors.

## RESULTS AND DISCUSSION

The results of this systematic review are presented according to the characteristics of the included studies, study quality assessment, willingness to pay (WTP), acceptance of CVD screening, and the factors influencing WTP. These findings are discussed to provide evidence for future cardiovascular disease screening programs.

### Details Of Included Studies

A total of 163 articles were identified through systematic database searching. Based on the title and abstract, a total of 105 studies were excluded because not related to WTP.

As shown in Figure 1. Seven studies examined the social aspect of WTP for

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cardiovascular disease screening, such as screening for hypertension, diabetic complications, heart disease, and heart attack. The articles were published until December 2024 and conducted in many countries such as Malaysia, Vietnam, Iran, Singapore, Canada, the United Kingdom, and the United States. The summary of the included study is shown Table 3. Summary Of Study Characteristics.

**Characteristics Of Included Study**

Studies were all conducted in seven (7) different countries, 2 countries with lower-middle-income (Tran *et al*., 2018; Ghahramani *et al*., 2022) (Vietnam and Iran) 4 countries with high-income-economies (Fletcher *et al*., 2019; Ringrose *et al*., 2020; Dickie *et al*., 2022; Ang *et al*., 2023), and 1 upper-middle-income country (Maharajan *et al*., 2023). Based on data from research studies, the population used in the study was mostly women with an age range of 55-65 years; some studies included patients who had been diagnosed with hypertension or diabetes. The total number of respondents included in this study was 24,642. The research conducted was a cross-sectional study with questionnaires used as the instrument; there were 3 studies conducted in an online survey. The methods used to calculate WTP are contingent valuation and discrete choice, and some studies use other methods.

**Study Quality Assessment**

The Quality of the study was reviewed using the critical appraisal method with JBI for a cross-sectional study. The results of the quality assessment show that the papers included in this study met the study's requirements with a mean score of 7/8.

**Willingness To Pay For Cardiovascular Disease Screening**

The willingness to pay for cardiovascular disease screening varied among different countries because the currency used in the study is based on the country itself; the results of WTP can be compared if the currency is converted to US$. From 7 articles that have been reviewed the method to measure the WTP also varies, the most commonly used method is contingent valuation and discrete choices, in the study with the contingent valuation method (CVM) conducted in Malaysia showed the respondents were willing to pay up to RM 100 ($217,63) per year for heart disease diagnostic test (Maharajan *et al*., 2023). This amount of WTP does not mean it can be paid instantly because the cost of such tests is always a concern among the public, so there is a need for possible risk-sharing mechanisms, such as community health insurance. An individual’s desire to consider a service, even if it is suggested by their physician, may be influenced by out-of-pocket expenses.

A WTP study conducted in the same country might have a different WTP value. For example, in Iran, the study from Ghahramani, et. al, a WTP for a diabetic complication preventive program shows WTP values from rural countries are lower than urban countries, this package’s WTP varied from $169 - $374,5 depending on the

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complication, and degree of risk reduction (Ghahramani *et al*., 2022).

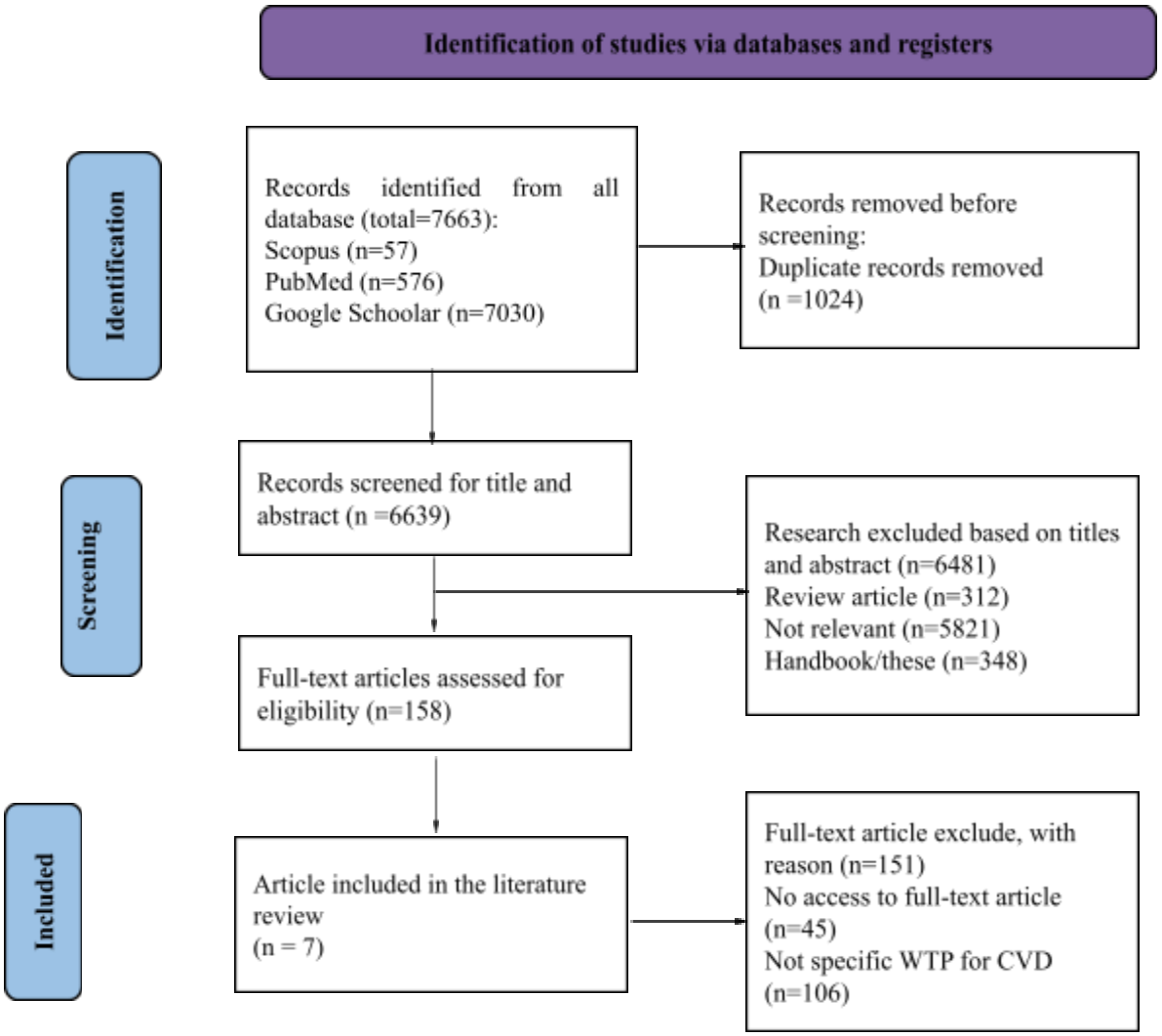


Figure 1. PRISMA Flowchart

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The highest WTP values reported in the UK, i.e., $857 (£673.45), indicate a willingness to pay for a risk reduction program that includes a diagnosis of cardiovascular disease. A summary of WTP values is shown in Table 3.

**Acceptance Of CVD Screening**

The level of acceptance for cardiovascular disease (CVD) screening is based on the proportion of participants who want to pay for CVD diagnosis. The results were varied among the countries in the reviewed articles. However, the majority reported relatively high acceptance rates (above 70%), particularly in Malaysia, Iran, the UK, and Vietnam (hospital-based settings). In contrast, countries like Singapore, Vietnam (homecare-based), Canada, and the US showed moderate to low acceptance rates (below 70%) as seen in Table 2.

In general, public acceptance of CVD screening is well-received by the public, suggesting a general willingness across populations to improve health status and engage in preventive measures against cardiovascular disease. Nevertheless, contextual factors such as healthcare systems, socio-cultural values, and economic conditions play a significant role in influencing the level of acceptance.

**Factors Influencing Willingness To Pay For Cardiovascular Disease Screening**

Understanding the factors influencing an individual's willingness to pay is important for further study. The significant factors that influence WTP are educational level, highly educated patients, who tend to have a higher WTP and are willing to pay more for extra preventive action against cardiovascular disease.

The respondent who had a family history of cardiovascular disease is more likely to get an annual cardiovascular disease screening because they are aware of the benefits of preventing the disease, wealth or income, knowledge of disease and screening programs, perception of health, preference

for healthcare service, community health insurance, digital skills, and cost (Ang *et al*., 2023; Dickie *et al*., 2022; Fletcher *et al*., 2019; Ghahramani *et al*., 2022; Maharajan *et al*., 2023; Ringrose *et al*., 2020; Tran *et al*., 2018). Other factors, such as gender and age, had no significant influence (Ang *et al*., 2023)

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Table 1. WTP associated factors

| Associated factors | Vietnam | Iran | Canada | UK | Singapore | Malaysia | US |
|---|---|---|---|---|---|---|---|
| **Age** | X | X | X | X | X | X | X |
| **Gender** | X | X | X | X | √ | X | X |
| **Marital status** | X | √ | X | X | X | X | X |
| **Income** | √ | √ | X | X | √ | √ | X |
| **Expenditure** | X | X | X | X | X | X | X |
| **Insurance status** | √ | √ | X | X | X | X | X |
| **Occupation** | √ | X | X | X | X | X | X |
| **Education level** | √ | X | X | √ | √ | √ | X |
| **Location** | √ | √ | X | X | X | X | X |
| **Family disease history** | X | √ | X | X | X | √ | X |
| **Attitude toward special training** | X | √ | √ | √ | √ | X | √ |
| **Costs** | √ | √ | √ | √ | √ | √ | √ |

Table 2. Summary of WTP result

| Article | Acceptance (%) | WTP currency | Scenario offered |
|---|---|---|---|
| Vietnam | Hospital care (45.6-82.3%)<br>Home care (45.4-45.8%) | Hospital care service US$ 19.5-21.9<br>Home care service US$20.9-22.9 | General examination, ultrasound, ECG |
| Iran | 80% | US$ 344.6 | Preventive package |
| Canada | 24% | $120 | Ambulatory blood pressure testing |
| UK | 76% | $388,96 | Reduction in 5-year CVD risk |
| Singapore | 50% | $49 | Preference and WTP for blood pressure telemonitoring |
| Malaysia | 86% | $180.75 | WTP for diagnostic testing of heart disease |
| US | 13% | $32.74 | WTP for an annual vaccine to reduce the CVD risk |

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The study that has been reviewed was conducted in seven countries: 2 high-income countries, 1 upper-middle country, and 4 lower-middle countries. All seven studies reported positive willingness to pay for cardiovascular disease screening and preventive programs. The high response and acceptance of cardiovascular disease screening in the general population is a good sign for policymakers and healthcare professionals. As we know, cardiovascular disease is a worldwide problem that causes silent death and is one of the major disease burdens for the country, because the cost to manage stroke is high, considering the long hospital care required (Rochmah *et al.*, 2021; Kazi *et al.*, 2024).

Our findings align with prior systematic reviews, as shown in Table 4. WTP for cancer and diabetes screening, which also identified sociodemographic factors such as income, education, and disease knowledge as significant determinants. For example, Farabi *et al*. (Farabi *et al.*, 2020) found that men with higher education and a family history of prostate cancer were more likely to pay for screening. Similarly, Ghahramani *et al*. showed higher WTP among urban diabetic patients, consistent with our finding that location and socioeconomic status shape WTP for CVD screening.

However, the magnitude of WTP for cardiovascular disease screening appears to be higher in some contexts compared to other non-communicable diseases. This may reflect the perceived severity or immediacy of CVD events like heart attacks and strokes, which differ from a chronic condition with slower progression.

A study examining the WTP for cardiovascular disease screening across multiple countries, including Malaysia, Iran, Vietnam, Canada, Singapore, and the United States, reported a wide variation in WTP, ranging from $10 to $500. This variation was
attributed to differences in the type of screening test and the economic condition of each country. The study identified various screening methods for CVD, with ECG being the most recommended (Buttà *et al.*, 2020; Yagi *et al.*, 2024).

Additionally, a review of seven articles highlighted that sociodemographic factors significantly influence patients' decisions regarding their acceptance and WTP for CVD screening. This correlates to a study on WTP for prostate cancer screening with age, education, history of similar illness, and hospitalization affect the WTP value (Pedersen *et al*., 2011; Farabi *et al*., 2020).

A study conducted in Iran reported that willingness to pay for preventive measures among diabetic patients is not influenced by the diabetes type or severity of diabetes, the highest WTP was observed for a preventive package aimed at reducing blindness reported at 316.8$. Meanwhile, the WTP for preventive measures to reduce cardiovascular disease was 344.6$ (Ghahramani *et al.*, 2022).

The WTP results show a high value if a respondent has a family history of cardiovascular disease; a strong correlation between the perceived risk of heart disease

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and family history suggests that people who have a family history and are aware of the disease are more willing to pay for diagnostic test (Maharajan *et al.*, 2023). The WTP also increases with the perception and knowledge of the disease and the screening test. In the study setting of cardiovascular management care in hospital care and home care-based management that includes a service of blood pressure monitoring, the result was that hospital-based had higher WTP than home care-based management, because of people's knowledge about the service that the author has provided (Tran *et al.*, 2018).

Table 3. Summary of study characteristics

| Year, country | Study setting | Demographic Characteristics of Participant | No. of participant | Purpose of study | Study design | Instrument | Method for measuring WTP |
|---|---|---|---|---|---|---|---|
| **2023, Malaysia** | General population in four Malaysian state | Female, age > 60y.o covered with health insurance, blue-collar occupation | 1317 | Determine the willingness to pay (WTP) for the diagnosis of heart disease and the perceived risk of the condition. | cross-sectional | Online questionnaire | CVM |
| **2022, United State** | Adults, drawn from an online research panel Knowledge Network, Inc. | Patient > 18y.o diagnosed with diabetes without complication | 2204 | Explores how individuals perceive their risk of heart disease and the influence of information and risk perception on their marginal willingness to pay (MWTP) for risk reduction. | cross-sectional | Online questionnaire | Bayesian method |
| **2023, Singapore** | Singapore general population | The mean age of the study sample was 53 ± 15 years, 32 (64%) were female, and 23 (46%) were employed | 193 | This study aimed to elicit the preferences and willingness to pay for blood pressure (BP) telemonitoring programs | cross-sectional | Online Questionnaire | DCE |
| **2018, Vietnam** | Hanoi Heart Hospital in and out patients with heart disease. | Women age >60y.o, diagnosed with hypertension > 5 years, took medication at least 2 | 600 | Explored the preferences and WTP of patients with heart diseases for different home- and hospital-based services in Hanoi, Vietnam. | cross-sectional | Online Questionnaire | CVM |

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|---|---|---|---|---|---|---|---|
| **2022, Iran** | Iran Hospital in and out-patients with diabetes. | Male and female, married, higher income, more formal education years, full-time worker, aged 55 to <65 years, and a digital skills score of 36 | 557 | The purpose of this study was to calculate the WTP for a one-year preventive package to lower the risk of diabetic foot, cardiovascular, kidney, and ocular problems. | cross-sectional | Questionnaire and interview | CVM |
| **2019, Canada** | Patients undergoing ambulatory blood pressure monitoring at the University of Alberta Hypertension Clinic in Edmonton | Age, gender, ethnicity, employment status, monthly income, family history of CVD | 50 | The objective of this study was to assess patient perceptions of ambulatory blood pressure testing, tolerability, accessibility, and expense. | Experimental | Questionnaire | Direct question |
| **2019, United Kingdom** | Online survey of patients who have hypertension in the UK including an un-labelled discrete choice experiment (DCE) | Mean age 61, 45% female, 82% > 5 years since diagnosed with HT. | 1067 | To explore patient preferences for the management of hypertension in the UK. | cross-sectional | Questionnaire | DCE |

Table 4. Comparison of WTP study

| **Disease** | **Range of WTP (US$)** | **Key Influencing Factors** | **Method Used** | **Country Setting** |
|---|---|---|---|---|
| CVD | $10-500 | Knowledge, family history, cost, insurance | CVM, DCE, Bayesian | Multi country |
| Prostate Cancer | $20-250 | Age, education, perceived risk, and information source | CVM | High income |
| Diabetes | $170-375 | Income, education, risk perception, urban/rural | CVM | Iran |
| Breast Cancer | $50-200 | Insurance, knowledge, fear of diagnosis, and social influence | DCE | USA, Korea |

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Educational background has been identified as a factor influencing an individual's willingness to pay for screening services. Patients with a higher level of education, such as those with at least a high school diploma, are more willing to pay for these services. This is likely due to their greater awareness of the disease, a more accurate perception of the service's usefulness, and improved access to relevant information regarding the disease or diagnostic test (Tran *et al.*, 2018; Ang *et al.*, 2023). This is also a concern for the country, as public knowledge about cardiovascular disease and screening remains low. Policymakers can develop educational programs to raise awareness about cardiovascular diseases, including risk factors, symptoms, and the importance of behavioral changes for prevention.

Income and cost of the service are the most concerning factors that affect people's WTP and in some countries, the WTP also increases if they are covered by health insurance (Fletcher *et al.*, 2019). Having a higher income could increase the WTP values, which will benefit policymakers in designing a screening program to consider the package cost to differentiate the income deciles (Farabi *et al.*, 2020).

Diagnostic or screening tests such as blood pressure monitoring, blood glucose monitoring, lipid profile, and ECG are already available, but the cost is always a concerning issue for some people, so they tend to ignore taking the tests. This finding suggests that government should integrate fully funded cardiovascular disease screening programs or adopt cost sharing mechanism.

The diagnosis test or method based on the AHA guideline 2020 (Jones *et al*., 2025), the measurement of blood pressure in the office or clinic is most commonly used for hypertension diagnosis and follow-up (Unger *et al.*, 2020).

A study in the UK stated that patient preference for the screening also affects people's willingness to pay, Patients preferred home blood pressure monitoring over ambulatory blood pressure monitoring because of the convenience, ambulatory blood pressure monitoring caused discomfort in 40 patients and disturbed their sleep in 39 patients, and people perceived that the home would be the easiest venue to access future testing in a patient with hypertension (Fletcher *et al*., 2019; Ringrose *et al*., 2020).

Another finding of the study is that the public's knowledge about cardiovascular disease and risk is low (Topcu *et al*., 2023). This information is crucial for clinical practitioners to raise awareness about cardiovascular disease risk, enabling the public to be more informed about the disease and its screening. if more people are aware of the disease, they will do any preventive management care for cardiovascular disease in the future, and can prevent people from having a stroke (Denfeld *et al.*, 2022). The limited number of included studies may reduce the generalizability of the findings.

## CONCLUSION

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The willingness to pay ranged from US$ 10 to US$ 500 per annual screening test. The results of all reviewed studies indicate a high acceptance of CVD screening. Family history and perceived risk were the strongest factors influencing willingness to pay, in addition to cost.

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Submitted : 25 April 2025
Revised : 02 Januari 2026
Accepted : 21 Mei 2026
Published : 30 Juli 2026



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Accepted : 21 Mei 2026
Published : 30 Juli 2026



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