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A systematic review of cardiovascular disease policy models for predicting health and cost outcomes

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Introduction

Cardiovascular disease (CVD) imposes a high global burden, and its prevention and management involve multiple risk factors and complex interventions[1].

CVD accounted for 437 million disability-adjusted life years (DALYs), 19.2 million deaths, and 626 million prevalent cases globally in 2023[2].

Policy models have been widely constructed to predict population health outcomes and resource consumption of CVD, supporting policy and intervention planning

Study Aim

This study aims to systematically review published CVD policy models by summarizing their key characteristics, identifying research priorities, and critically evaluating their strengths and limitations to inform effective strategy formulation.

Methods

CVD policy model definition

A CVD policy model was operationally defined as a mathematical or simulation-based model or tool developed to project CVD-related health outcomes, healthcare utilization, costs, or cost-effectiveness at the population or health system level[3,4].

Searching

Searching: PubMed, Embase (Ovid), Web of Science and Scopus + Citation search

Search strategy keywords: CVD, policy model, healthcare utilization, and cost.

Publication date: the last 20 years (January 2006 - to June 2025).

Inclusion and exclusion Criteria

Inclusion criteria	Exclusion criteria
• The study should contain a policy model as defined.	• Clinical studies, abstracts, letters and reviews, protocols.
• The model predicted the long-term/lifetime outcomes (at least 10 years).	• The study used a conceptual model or framework.
• The model should focus on general or specific adult populations (aged ≥18 years) affected by or at risk of CVD as defined.	• CVD-related events, outcomes, or interventions were not included in the model or not a primary focus of the model.
• Eligible interventions should operate at the population or system level and should be specially for CVD.	• The study did not report sufficient details of the model structure or methodology.
• The studies should report population-level outcomes or benefits and include outcomes of healthcare utilization or costs.	• The model that evaluated interventions solely at the individual clinical decision-making level

Screening and data collection

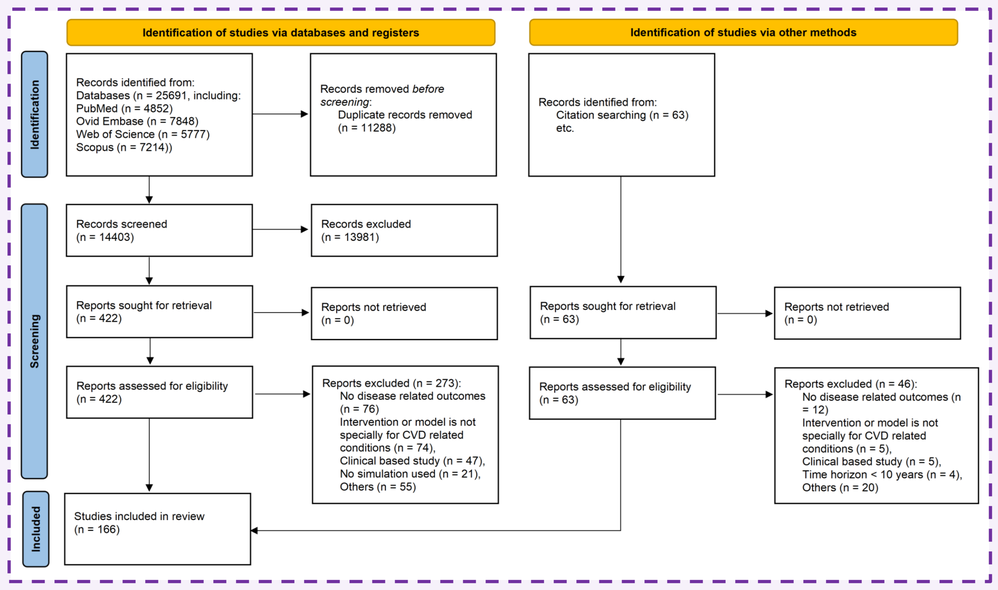
Screening and data collection was conducted by one reviewer and independently checked by two additional reviewers. Data collection included but not limited to authors and publication date, model purpose, perspective, model structure, study population, intervention, time period, risk functions and risk factors included, validation and calibration outcomes, and reported outcomes.

Strategy for data synthesis

We conducted a structured narrative synthesis, descriptive cross-comparisons, and a reporting quality assessment using a modified Philips checklist.

Results

PRISMA flow diagram

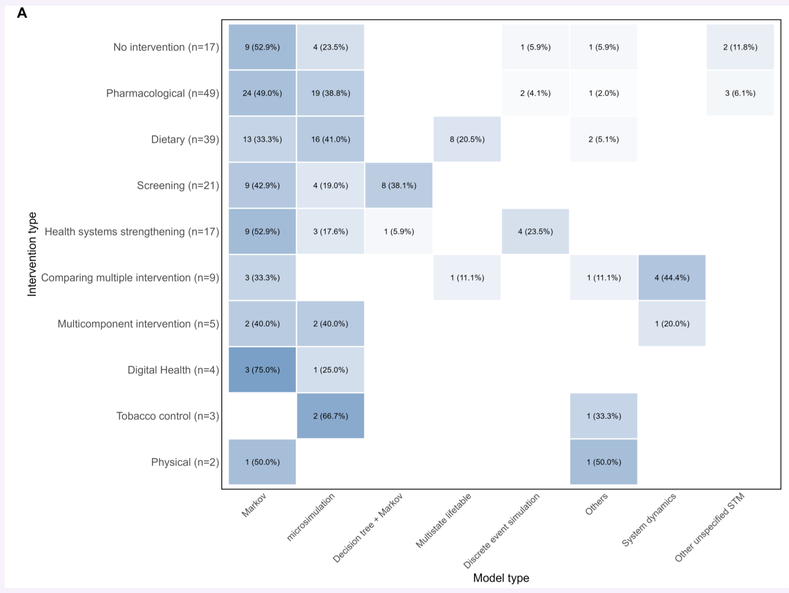


Evidence distribution

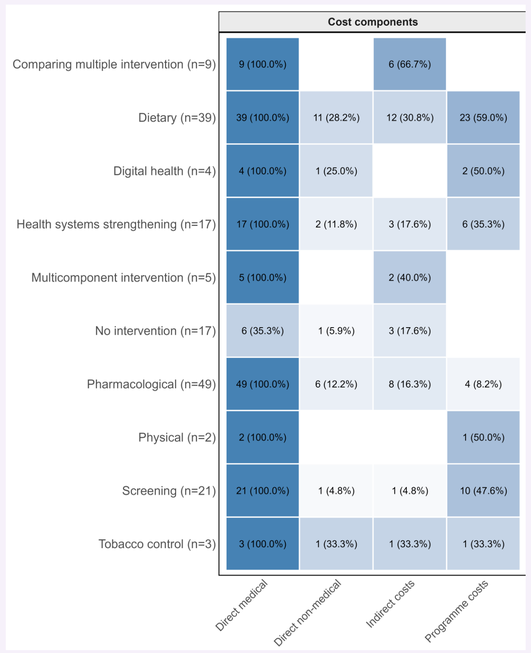
This review included 166 studies from 33 countries or regions, with 121 originating from high-income countries (72.9%).

Most studies focused on pharmacological or dietary interventions (53%), employed Markov or microsimulation (81.3%) models, and adopted lifetime horizons (45.8%).

Main results



Considerable heterogeneity in model types was observed across different interventions.



Cost reporting was uneven.

- Eight studies reported healthcare utilization. Calibration and validation were reported in 61 and 68 studies, respectively. Equity was considered in 68 studies, mainly through subgroup analyses.
- The mean quality score was moderate (70.45%), but data quality and structural assumptions were common limitations.

Conclusion

The evidence was geographically concentrated and methodologically heterogeneous.

To enhance the policy relevance of future CVD policy models, researchers should report decision-relevant outcomes, adhere to best practices and transparently report model structures, data sources, assumptions, calibration and validation.

References

[1] The World Health Organization. *Cardiovascular diseases (CVDs)*, <https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds)> (2025).
[2] Global Burden of Cardiovascular, D. & Risks, C. Global, Regional, and National Burden of Cardiovascular Diseases and Risk Factors in 204 Countries and Territories, 1990-2023. *J Am Coll Cardiol* **86**, 2167-2243 (2025).
[3] Unal, B., Capewell, S. & Critchley, J. A. Coronary heart disease policy models: a systematic review. *BMC Public Health* **6**, 213 (2006).
[4] Putri, S. *et al.* Policy models for preventative interventions in cardiometabolic diseases: a systematic review. *BMC Health Serv Res* **25**, 635 (2025).

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