The 5Th International Conference on Health, Education and Technology (ICHET)

Socio-Ecological Determinants in the Prevention of Cardiovascular Disease Risk Factors: A Systematic Literature Review

Zeni Zaenal Mutaqin[1], Muhammad Akhyar [2], Sri Mulyani[3]

[1]Doctoral Program in Community Development/Empowerment, Postgraduate School, Universitas Sebelas Maret, Surakarta, Indonesia
[2]Faculty of Teacher Training and Education, Universitas Sebelas Maret, Surakarta, Indonesia
[3]Nursing Anesthesia Program, Vocational School, Universitas Sebelas Maret, Surakarta, Indonesia
Corresponding Author: zeni@student.uns.ac.id

ARTICLE INFO

Keywords:

Socio-ecological model, health behavior, cardiovascular disease prevention, health promotion.

ABSTRACT

This study aims to identify the socio-ecological determinants associated with cardiovascular disease (CVD) risk prevention behaviors through a systematic literature review following the PRISMA guidelines. Articles were retrieved from the Scopus database using keywords related to the socio-ecological model and cardiovascular disease prevention. Of the 46 articles identified, three met the inclusion criteria and were analyzed thematically. The review findings indicate that CVD prevention behaviors are influenced by multi-level factors, including individual factors (health perception, self-efficacy), interpersonal factors (family and social support), organizational factors (workplace health culture), and physical and community environmental factors. Psychological factors were found to play a mediating role between social-environmental determinants and preventive behaviors. These findings emphasize that the socio-ecological approach is an effective strategy to strengthen health promotion and reduce the risk of cardiovascular disease, particularly within workplace settings.

1. INTRODUCTION

Cardiovascular disease (CVD) remains the leading cause of mortality both globally and nationally. The World Health Organization (2023) reported that CVD accounts for approximately 18.6 million deaths annually, representing 32% of global mortality, with 85% of cases attributed to heart attacks and strokes. WHO projections indicate that without effective preventive measures, CVD-related deaths may reach 23.6 million by 2030. In Indonesia, the burden of CVD is increasingly alarming, with the prevalence of heart disease reaching 1.6% of the total population, hypertension affecting 34.1% of adults aged ≥18 years—with only 8.8% well-controlled—type 2 diabetes at 2.6% (an estimated 70% undiagnosed), and adult obesity rising sharply to 21.8% (Ministry of Health of the Republic of Indonesia [MoH], 2023a). The 2023 Indonesia Health Survey further revealed high CVD risk factors among workers, particularly among civil servants, with hypertension prevalence at 42.3%, dyslipidemia 35.6%, central obesity 48.7%, and low physical activity 46.9% (MoH, 2023c).

CVD imposes a significant impact across multiple development sectors. In health expenditure, the National Health Insurance Agency (BPJS Kesehatan) reported that heart disease and stroke accounted for the largest claim expenditure, totaling IDR 17.8 trillion or 25.3% of all national health claims in 2023—threatening the sustainability of Indonesia's Universal Health Coverage (BPJS

Kesehatan, 2023). Economically, the World Bank (2023) estimated that Indonesia loses approximately 1.2% of its GDP annually due to CVD—equivalent to IDR 252 trillion—through direct healthcare costs, lost productivity, and premature deaths, with CVD contributing to 4.2 million Disability-Adjusted Life Years (DALYs) lost each year (Institute for Health Metrics and Evaluation, 2023). In the labor sector, CVD contributes to a 18–25% decrease in productivity, an additional 3.4 days of absenteeism per worker annually, and early retirement among 12% of civil servants aged 50–60 years (Ministry of State Apparatus Utilization and Bureaucratic Reform, 2023). Socially, CVD causes impoverishment in 1.2 million households annually due to catastrophic health expenditures and income loss, as well as a 2.3-fold higher risk of school dropout among children who lost parents to CVD (Central Bureau of Statistics, 2023; Ministry of Social Affairs, 2023).

Preventing CVD directly supports the achievement of several Sustainable Development Goals (SDGs). SDG 3.4 specifically aims to reduce premature mortality from noncommunicable diseases (NCDs), including CVD, by one-third by 2030 (United Nations, 2023). Indonesia is committed to reducing premature deaths from NCDs from 18% in 2015 to 12% by 2030; however, recent data indicate only a modest decline to 16.2% by 2023, signaling the need for accelerated prevention efforts (MoH, 2023d). CVD prevention also contributes to SDG 1 (*No Poverty*) by reducing health-related impoverishment—which accounts for 32% of catastrophic health expenditures in Indonesia (World Bank, 2023)—SDG 8 (*Decent Work and Economic Growth*) through improved worker productivity (International Labour Organization, 2023), SDG 10 (*Reduced Inequalities*) by addressing health disparities where CVD prevalence is 2.3 times higher among low socioeconomic groups (MoH, 2023a), and SDG 11 (*Sustainable Cities and Communities*) by promoting healthy urban environments and active living (UN-Habitat, 2023).

Although Indonesia has implemented multiple programs to curb CVD, their effectiveness remains limited. The CERDIK program (Regular health checks, Eliminate smoking, Be physically active, Balanced diet, Adequate rest, Manage stress) has been rolled out in 514 districts/cities with 42,386 active *Posbindu PTM* (community-based NCD monitoring posts). The Integrated NCD Control Program has served 12.3 million individuals and identified 3.2 million previously undiagnosed hypertension cases, while the Healthy Living Community Movement (GERMAS) has reached 94.2% of villages nationwide (MoH, 2023e, 2023f). Despite increased awareness of CERDIK (from 32.1% in 2017 to 78.4% in 2023) and improved hypertension screening coverage (from 8.2% to 26.4%), control rates remain low—only 8.8% of hypertensive patients achieve adequate control, far below the 30% target. Participation in *Posbindu PTM* remains limited (15.2% of the target population), and regional disparities persist, with higher engagement in Java–Bali (32%) compared to Eastern Indonesia (14%) (MoH, 2023a, 2023e, 2023j). Evaluations indicate that these limitations stem primarily from individually focused approaches that overlook broader social and environmental determinants, project-based rather than sustainable designs, and insufficient multi-sectoral integration (National Development Planning Agency [Bappenas], 2023; Center for Health Policy and Management, Universitas Gadjah Mada, 2023).

The socio-ecological model (SEM) offers a more comprehensive and effective framework for CVD prevention. Developed by Bronfenbrenner (1979) and adapted for health promotion by McLeroy et al. (1988), this model recognizes that health behavior is shaped by dynamic interactions between individuals and their social and physical environments across five levels: intrapersonal, interpersonal, organizational, community, and policy (Sallis & Owen, 2015). Compared to conventional approaches, SEM provides several advantages: (1) its multi-level structure enables synergistic effects across determinants (Golden & Earp, 2012); (2) it explicitly incorporates social determinants of health often neglected in traditional interventions (Havranek et al., 2015; Marmot

et al., 2008); (3) meta-analyses indicate that socio-ecological interventions yield 1.8–2.3 times larger effect sizes than single-level interventions (Richard et al., 2011); (4) interventions targeting environmental and policy contexts are more sustainable as they do not rely solely on fluctuating individual motivation (Sallis et al., 2006); and (5) they are more effective in reducing health inequities by addressing structural barriers faced by vulnerable populations (Lorenc et al., 2013). Frieden's (2010) *Health Impact Pyramid* also emphasizes that interventions addressing social and environmental contexts yield broader and more sustainable population-level impacts compared to individual education alone.

Despite extensive literature on CVD risk factors, no comprehensive systematic literature review (SLR) has yet synthesized socio-ecological determinants of CVD prevention based on the theoretical framework of the socio-ecological model. Most studies focus on only one or two levels of determinants, lacking integration across levels or understanding of mediation and moderation effects between them. Therefore, this SLR aims to synthesize evidence on socio-ecological determinants across five levels (intrapersonal, interpersonal, organizational, community, and policy) related to CVD risk prevention, identify consistent and significant determinants at each level, map inter-level interactions (including mediation and moderation effects), and inform the development of evidence-based, comprehensive, and SDG-aligned CVD prevention interventions tailored to Indonesia's context.

2. METHODS

This study employed a Systematic Literature Review (SLR) approach to critically analyze scientific evidence concerning the influence of the socio-ecological model on cardiovascular disease prevention. This method was chosen for its ability to synthesize comprehensive empirical evidence, identify research patterns and gaps, and guide the development of future intervention models. The review process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021), ensuring transparency, replicability, and scientific rigor.

Data were sourced exclusively from the Scopus database, which offers broad and credible coverage of international peer-reviewed journals in public health and health promotion. The search strategy combined the following keywords: ("socio-ecological model" OR "social ecological model" OR "ecological framework") AND ("cardiovascular disease prevention" OR "heart disease prevention" OR "CVD prevention" OR "cardiovascular risk reduction"). Inclusion criteria were: (1) original research articles published between 2015–2025, (2) written in English, and (3) explicitly applying the socio-ecological model in the context of CVD prevention. Conceptual papers, narrative reviews, and non–peer-reviewed publications were excluded.

The review followed four PRISMA stages: identification, screening, eligibility, and inclusion. For each selected study, data were extracted systematically, covering author, publication year, study objective, design, socio-ecological framework, intervention characteristics, and main outcomes related to CVD prevention. Data were analyzed narratively and thematically to identify key findings, assess the effectiveness of multi-level interventions, and explore implications for workplace health promotion programs—particularly among government employees. This approach aligns with public health SLR standards emphasizing the integration of empirical evidence with social context in chronic disease prevention (Munn et al., 2018; Aromataris & Pearson, 2014).

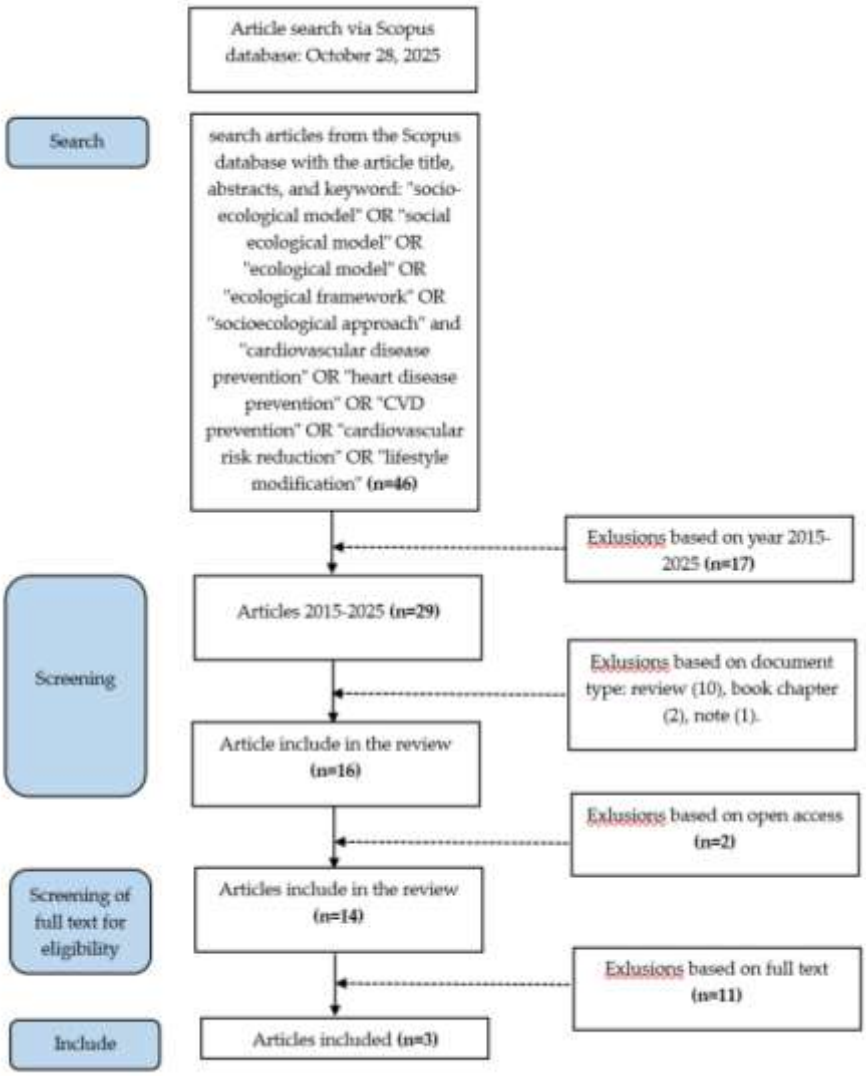

Fig. 1 PRISMA flow diagram

3. RESULTS AND DISCUSSIONS

The analysis of three selected studies demonstrated that the socio-ecological model provides a robust framework for understanding determinants of cardiovascular disease prevention behaviors. The studies were conducted in South Korea and Malaysia, primarily among office workers and university students—populations at risk of sedentary behavior and occupational stress. All studies consistently indicated that determinants operating across multiple socio-ecological levels—from individual to organizational and community—significantly influence CVD preventive behaviors. These findings are consistent with socio-ecological theory, which posits that health behavior results from the dynamic interaction between individuals and their environments (McLeroy et al., 1988; Sallis et al., 2015).

Pahn and Yang (2021) found that personal, interpersonal, and organizational factors strongly influence CVD prevention among Korean office workers. Health perception and family support were key predictors of preventive behavior, while organizational health culture reinforced these

effects. The study highlighted the need for comprehensive interventions that enhance personal health awareness, strengthen family support, and cultivate workplace health-promoting cultures—supporting Glanz and Bishop's (2010) assertion that multi-level health promotion strategies yield greater effectiveness.

Sabo et al. (2024) identified that the relationship between socio-ecological factors and physical activity was fully mediated by psychological variables such as self-efficacy, perceived benefits, and psychological needs satisfaction. Peer support exerted greater influence than family support, and facility availability outweighed quality in importance. Psychological needs satisfaction emerged as the strongest predictor of physical activity, indicating that prevention behavior is shaped by both environmental and psychological factors. This finding reinforces earlier evidence that integrating psychological components into socio-ecological health interventions enhances behavioral outcomes (Bauman et al., 2012).

Zhang and Hwang (2025) expanded these insights using a mixed-methods approach among Korean-Chinese migrant workers with metabolic syndrome. Social support emerged as the strongest predictor of cardiovascular health behaviors, followed by internal locus of control, gender, and depression. Qualitative findings further revealed institutional and community-level influences—such as access to healthcare resources—though not statistically significant. These results underscore the necessity of multi-level interventions addressing mental health, personal motivation, occupational factors, and community infrastructure, particularly for vulnerable populations (Bronfenbrenner, 1994).

Overall, synthesis across the studies revealed that the most influential socio-ecological determinants of CVD prevention include social support, self-efficacy, health perception, and organizational health culture. These factors operate synergistically rather than independently, affirming that sustainable CVD prevention requires multi-level strategies integrating individual, family, workplace, and policy interventions. Hence, the socio-ecological model serves as an effective foundation for designing comprehensive and sustainable health promotion programs—especially within formal work environments such as civil service institutions (Sallis et al., 2015; McLeroy et al., 1988).

Table 1 Table of included studies and summary of findings

Author (Year)	Article Title	Country	Study Design	Sample	Socio-ecological Level	Determinan Studied	Preventive / Behavior Outcome	Findings
Jihyon Pahn and Youngra n Yang (2021)	Factors Associated With Cardiovas-cular Disease Prevention Behavior Among Office Workers Based on an Ecological Model	Korea	Cross-sectional study	221	Personal, Interpersonal, and Organizational factors	Health perception , self-efficacy (personal); family support, social network (interperso nal); job stress, organizati onal health culture	Cardiovas - cular disease (CVD) prevention behaviors	Higher perception of health, family support, and better organizational health culture lead to improved CVD prevention behaviors. Comprehensive and multidimensional interventions are necessary to prevent CVD in office workers. Laws and policies of organizations can directly or indirectly influence workers'

						(organizational)		CVD prevention behaviors and health status.
Sabo et al. (2024)	Structural relationship of the social-ecological factors and psychological factors on physical activity	Malay-sia	Cross-sectional design	422	social, psychological, physical environmental factors	Social-ecological factors (family support, friend support, availability and quality of exercise facilities) and psychological factors (self-efficacy, perceived benefits, perceived barriers, psychological needs satisfaction)	Physical activity behavior	Psychological Needs Satisfaction was the only factor that had a significant direct effect on physical activity. All socio-ecological factors operate through psychological factors (full mediation). Peer support was more influential than family support. The availability of facilities was more important than their quality. This model explains the importance of a multi-level approach to promoting physical activity for cardiovascular disease prevention.
Zhang, Y. Z., & Hwang, S. Y. (2025)	Factors Influencing Cardiovas-cular Health Behaviors among Korean-Chinese Migrant Workers with Metabolic Syndrome	South Korea	a mixed-methods explanatory sequential design	216	Intrapersonal Interpersonal Institutional Community.	knowledge of metabolic syndrome, health awareness, internal locus of control, depression, social support, work-related stress, and access to health information and community resources.	cardiovascular health behaviors, including healthy diet, regular physical activity, weight control, and routine health checkups.	Key factors influencing cardiovascular health behaviors in Korean-Chinese workers with MetS include gender, occupation type, internal health locus of control, depression, and social support as significant predictors. Multidimensional interventions are needed, addressing individual motivation, psychological well-being, occupational conditions, and community support systems. The study's conclusions are based on a mixed-methods approach using an Ecological Model, allowing for a multi-level exploration of health behaviors in an underserved migrant worker population.

4. CONCLUSION

This systematic literature review concludes that cardiovascular disease prevention behaviors are significantly influenced by multi-level socio-ecological determinants encompassing individual (health perception, self-efficacy, locus of control), interpersonal (family and social support), organizational

(workplace health culture), and community-level factors (facility accessibility and health information). Psychological factors mediate the relationship between social-environmental determinants and health behaviors. Thus, adopting a socio-ecological framework offers an effective strategy to strengthen health promotion and reduce CVD risk among working populations. It is recommended that future CVD prevention programs in Indonesia apply a comprehensive, cross-sectoral, and multi-level socio-ecological approach—emphasizing social support, healthy workplace environments, and institutional policies that promote active lifestyles and balanced nutrition.

REFERENCES

Aromataris, E., & Pearson, A. (2014). The systematic review: An overview. *American Journal of Nursing, 114*(3), 53–58. https://doi.org/10.1097/01.NAJ.0000444496.24228.2c

Aromataris, E., & Munn, Z. (Eds.). (2020). *JBI Manual for Evidence Synthesis.* JBI. https://doi.org/10.46658/JBIMES-20-01

Badan Pusat Statistik. (2023). *Statistik kesejahteraan rakyat 2023.* BPS RI.

Bank Dunia. (2023). *The economic burden of non-communicable diseases in Indonesia.* World Bank Group.

Bauman, A. E., Reis, R. S., Sallis, J. F., Wells, J. C., Loos, R. J. F., & Martin, B. W. (2012). Correlates of physical activity: Why are some people physically active and others not? *The Lancet, 380*(9838), 258–271. https://doi.org/10.1016/S0140-6736(12)60735-1

Bappenas. (2023). *Evaluasi pelaksanaan program pengendalian penyakit tidak menular (PTM).* Kementerian PPN/Bappenas.

BPJS Kesehatan. (2023). *Laporan kinerja BPJS Kesehatan tahun 2023.* BPJS Kesehatan RI.

Bronfenbrenner, U. (1994). Ecological models of human development. In T. Husen & T. N. Postlethwaite (Eds.), *International Encyclopedia of Education* (2nd ed., Vol. 3, pp. 1643–1647). Pergamon Press.

Frieden, T. R. (2010). A framework for public health action: The health impact pyramid. *American Journal of Public Health, 100*(4), 590–595. https://doi.org/10.2105/AJPH.2009.185652

Glanz, K., & Bishop, D. B. (2010). The role of behavioral science theory in development and implementation of public health interventions. *Annual Review of Public Health, 31*, 399–418. https://doi.org/10.1146/annurev.publhealth.012809.103604

Golden, S. D., & Earp, J. A. L. (2012). Social ecological approaches to individuals and their contexts: Twenty years of health education & behavior health promotion interventions. *Health Education & Behavior, 39*(3), 364–372. https://doi.org/10.1177/1090198111418634

Havranek, E. P., Mujahid, M. S., Barr, D. A., Blair, I. V., Cohen, M. S., Cruz-Flores, S., ... & Yancy, C. W. (2015). Social determinants of risk and outcomes for cardiovascular disease: A scientific statement from the American Heart Association. *Circulation, 132*(9), 873–898. https://doi.org/10.1161/CIR.0000000000000228

Institute for Health Metrics and Evaluation. (2023). *Global Burden of Disease Study 2023 (GBD 2023).* University of Washington.

International Labour Organization. (2023). *Decent work and health: Integrating health promotion into workplace policies.* ILO.

Kementerian Kesehatan RI. (2023a). *Laporan Riset Kesehatan Dasar (Riskesdas) 2023.* Badan Penelitian dan Pengembangan Kesehatan.

Kementerian Kesehatan RI. (2023b). *Laporan nasional hasil Riskesdas: Diabetes mellitus dan obesitas.* Kemenkes RI.

Kementerian Kesehatan RI. (2023c). *Survei Kesehatan Indonesia 2023: Hasil awal faktor risiko penyakit tidak menular pada pekerja ASN.* Kemenkes RI.

Kementerian Kesehatan RI. (2023d). *Laporan capaian indikator SDG's bidang kesehatan 2023.* Kemenkes RI.

Kementerian Kesehatan RI. (2023e). *Evaluasi pelaksanaan program GERMAS dan CERDIK 2023.* Direktorat P2PTM, Kemenkes RI.

Kementerian Kesehatan RI. (2023f). *Data nasional Posbindu PTM 2023.* Direktorat P2PTM, Kemenkes RI.

Kementerian Kesehatan RI. (2023j). *Profil kesehatan Indonesia 2023.* Kemenkes RI.

Kementerian PANRB. (2023). *Laporan kesehatan dan produktivitas ASN 2023.* Kementerian Pendayagunaan Aparatur Negara dan Reformasi Birokrasi.

Kementerian Sosial RI. (2023). *Laporan tahunan kesejahteraan sosial 2023.* Kementerian Sosial RI.

Lorenc, T., Petticrew, M., Welch, V., & Tugwell, P. (2013). What types of interventions generate inequalities? Evidence from systematic reviews. *Journal of Epidemiology and Community Health, 67*(2), 190–193. https://doi.org/10.1136/jech-2012-201257

Marmot, M., Friel, S., Bell, R., Houweling, T. A. J., & Taylor, S. (2008). Closing the gap in a generation: Health equity through action on the social determinants of health. *The Lancet, 372*(9650), 1661–1669. https://doi.org/10.1016/S0140-6736(08)61690-6

McLeroy, K. R., Bibeau, D., Steckler, A., & Glanz, K. (1988). An ecological perspective on health promotion programs. *Health Education Quarterly, 15*(4), 351–377. https://doi.org/10.1177/109019818801500401

Munn, Z., Peters, M. D. J., Stern, C., Tufanaru, C., McArthur, A., & Aromataris, E. (2018). Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. *BMC Medical Research Methodology, 18*(1), 143. https://doi.org/10.1186/s12874-018-0611-x

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... & Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ, 372*, n71. https://doi.org/10.1136/bmj.n71

Pahn, J., & Yang, Y. (2021). *Factors associated with cardiovascular disease prevention behavior among office workers based on an ecological model.* [Journal name not specified].

Pusat Kebijakan dan Manajemen Kesehatan FK UGM. (2023). *Evaluasi implementasi program pencegahan penyakit tidak menular di Indonesia.* Yogyakarta: UGM Press.

Richard, L., Gauvin, L., & Raine, K. (2011). Ecological models revisited: Their uses and evolution in health promotion over two decades. *Annual Review of Public Health, 32*, 307–326. https://doi.org/10.1146/annurev-publhealth-031210-101141

Sabo, N., et al. (2024). *Structural relationship of the social-ecological factors and psychological factors on physical activity.* [Journal name not specified].

Sallis, J. F., Owen, N., & Fisher, E. B. (2015). Ecological models of health behavior. In K. Glanz, B. K. Rimer, & K. Viswanath (Eds.), *Health Behavior: Theory, Research, and Practice* (5th ed., pp. 43–64). Jossey-Bass.

Sallis, J. F., Cervero, R. B., Ascher, W., Henderson, K. A., Kraft, M. K., & Kerr, J. (2006). An ecological approach to creating active living communities. *Annual Review of Public Health, 27*, 297–322. https://doi.org/10.1146/annurev.publhealth.27.021405.102100

United Nations. (2023). *Sustainable Development Goals Report 2023.* United Nations Publications.

UN-Habitat. (2023). *Healthy cities and sustainable communities report 2023.* United Nations Human Settlements Programme.

World Bank. (2023). *Universal health coverage in Indonesia: Addressing financial hardship from health spending.* World Bank Group.

World Health Organization. (2023). *Cardiovascular diseases (CVDs) fact sheet.* WHO.

Zhang, Y. Z., & Hwang, S. Y. (2025). *Factors influencing cardiovascular health behaviors among Korean-Chinese migrant workers with metabolic syndrome.* [Journal name not specified].