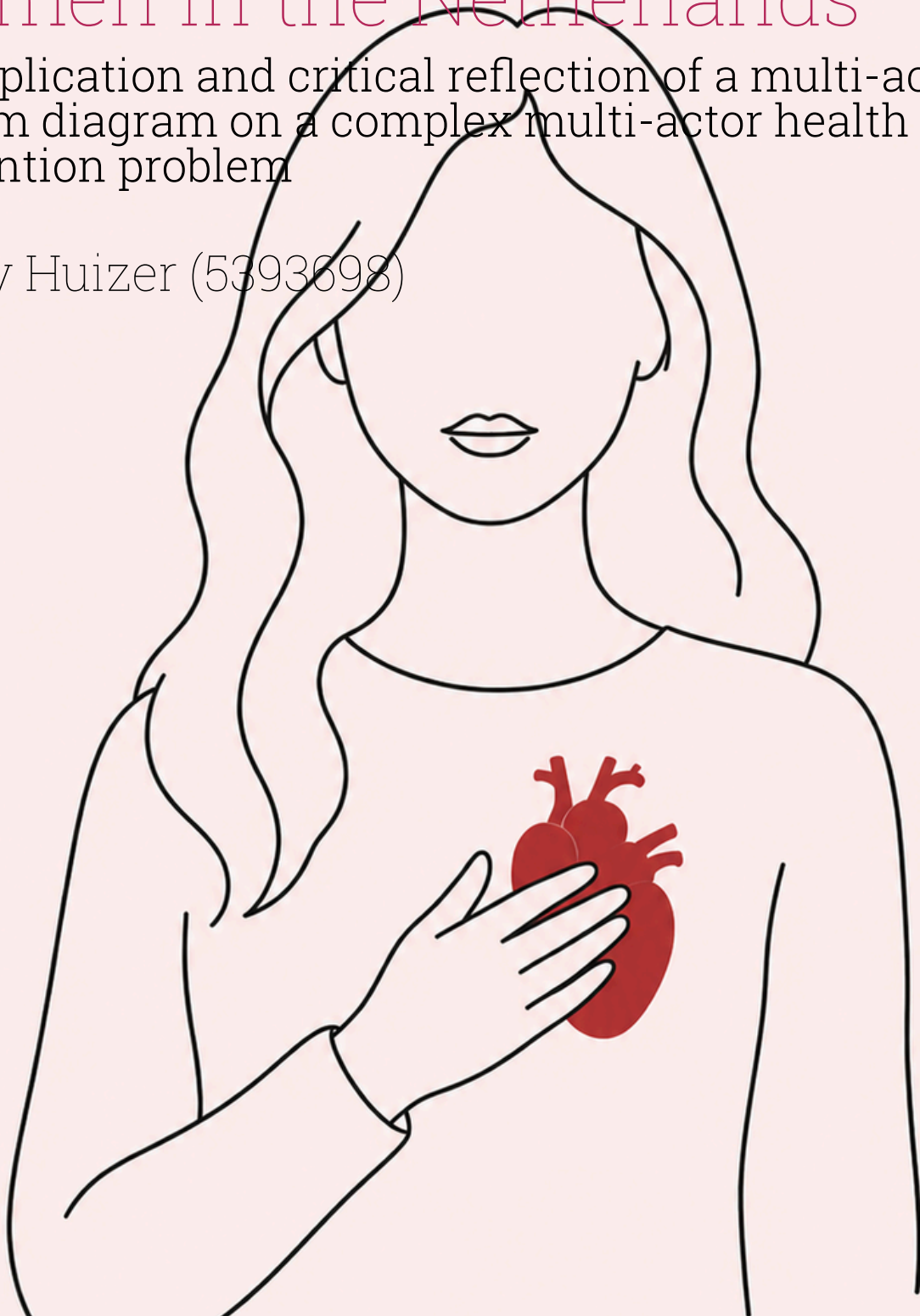


A System Analysis Approach to Strengthen Cardiovascular Disease Prevention Policy for Women in the Netherlands

An application and critical reflection of a multi-actor system diagram on a complex multi-actor health prevention problem

Romy Huizer (5393698)



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Romy Huizer (5393698)

Supervisor:	Dr. S. (Saba) Hinrichs-Krapels
Second advisor:	Dr. H.G. (Haiko) van der Voort
External advisor:	Ushma Issar (Rypple)
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Faculty:	Faculty Technology, Policy and Management, TU Delft

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Finally, I would like to reflect briefly on what this thesis represents for me. By choosing a subject that sits at the intersection of systems thinking, policy analysis, and public health, I have stayed close to the core of what the TPM faculty has taught me: that complex problems require multiple perspectives, and that understanding a system means understanding the actors, interests, and dynamics that give it shape. It is a way of thinking I intend to carry with me into my professional life. This topic is also close to my heart, not because I have personal experience with cardiovascular disease, but simply because I am a woman. I hope that in the future, every woman has an equal chance at a healthy life. Writing a thesis may feel like a small step, but choosing to direct it specifically toward women's health felt like the least I could do to contribute to that future.

Executive summary

Cardiovascular disease (CVD) remains the leading cause of death worldwide and one of the primary causes of premature mortality among women in the Netherlands, where an average of 57 women die from heart or vascular disease each day (Hartstichting, 2024). Despite substantial scientific evidence demonstrating that women have distinct cardiovascular risk profiles, current Dutch prevention policy has been developed largely without explicit attention to sex-specific risk factors and determinants. Existing research on CVD prevention spans a wide range of approaches, including epidemiological modelling, clinical effectiveness studies, and general population surveillance, but tends not to integrate system-level actor dynamics with the causal mechanisms through which prevention policy operates and fails. This thesis addresses that gap by applying a multi-actor system diagram as a central analytical framework to examine how CVD prevention for women is organised, contested, and potentially strengthened within the Dutch health system.

The main question of this thesis is:

How can a multi-actor system diagram contribute to strengthening cardiovascular disease prevention policy for women in the Netherlands?

To answer this question, an iterative multi-actor system diagram was developed following the method described by Enserink et al. (2022). The analysis proceeded through six diagram versions. Version 0.0 mapped the national CVD prevention system at a high level of aggregation. Versions 0.1 and 0.2 narrowed the scope to the overweight/obesity and smoking sub-systems respectively, each modelling the actor means, internal system factors, and feedback loops that shape prevention outcomes for adult women. Version 1.0 translated four evidence-based interventions identified through a targeted literature review into a hypothetical women-specific diagram, mapping their causal pathways within the existing actor landscape. Versions 2.0, 2.1, and 2.2 updated each of these diagrams on the basis of seven semi-structured interviews with actors from four sectors: national policy, built environment, public health, and the commercial sector. Interview data were analysed using Braun and Clarke's (2006) six-phase thematic analysis with a hybrid deductive-inductive coding approach in Atlas.ti, generating 70 codes and six themes.

The actor analysis confirmed that no actor in the current system holds an explicit mandate to address sex-specific CVD risk. The Ministry of Health, Welfare and Sport (VWS) coordinates prevention at the national level through the National Prevention Agreement (NPA) and the Healthy and Active Life Agreement (GALA), the Dutch Association of Health Insurers (ZN) controls reimbursement through the Health Insurance Act (Zvw), the Association of Dutch Municipalities (VNG) coordinates municipal implementation, and the municipal public health services (GGD) and the Dutch College of General Practitioners (LHV) govern local delivery and primary care access respectively. Commercial conflict actors, principally the tobacco industry and the commercial food sector, actively counteract prevention goals through marketing and

lobbying. The formal actor positions do not reflect the informal dynamics, coordination failures, and mutual dependencies that determine how the system actually functions.

The literature review identified twelve evidence-based interventions for women's CVD prevention. Four met all selection criteria and were operationalisable within existing actor mandates: general practitioner (GP) training on sex-specific CVD risk factors, assigned to LHV; a sex-specific smoking cessation outreach programme, assigned to GGD in collaboration with the Alliance Netherlands Smokefree (Alliantie Nederland Rookvrij, ANR); an extension of Combined Lifestyle Intervention (GLI) eligibility under the Zvw to women with sex-specific risk profiles, assigned to ZN; and investment in safe physical activity infrastructure, assigned to VNG. These four interventions are represented as actor means in diagram 1.0, which makes two dynamics visible that individual intervention evaluation would not detect: a reinforcing feedback loop in which chronic stress and cessation failure sustain each other among female smokers in high-stress circumstances, and a balancing pathway in which VNG infrastructure investment depletes the municipal health budget it depends on.

The thematic analysis of seven semi-structured interviews produced six themes characterising how actors understand the prevention system. The first theme, economic logic drives and limits prevention, reflects the curative incentive architecture of the Zvw, which creates a financial disadvantage for prevention investment. The second, policy is designed from a filtered reality, describes how prevention policy is formulated from an expert perspective that does not reflect the financial insecurity, time constraints, and social circumstances shaping health behaviour in practice. The third, conflicting system logics undermine prevention, identifies a fundamental incompatibility between the health system and commercial, digital, and market systems that actively adapt to neutralise health interventions. The fourth, fragmented responsibility blocks systemic change, describes a system in which accountability for health outcomes is diffuse and owned by no single actor. The fifth, women's health needs are systematically overlooked across domains, confirms that the invisibility of women in CVD prevention operates simultaneously in scientific, clinical, and spatial domains. The sixth, ownership and co-creation as conditions for lasting change, identifies genuine citizen participation as a cross-cutting prerequisite for durable prevention.

The interview-validated diagrams added several elements absent from the documentary evidence base. In the overweight sub-system (2.1), social media amplification of unhealthy dietary norms, point-of-sale decision complexity, and actor coordination failure were introduced as new factors. In the smoking sub-system (2.2), autonomous secular trends as a counterfactual to policy attribution and product substitution as an unintended consequence of excise tax increases were established. In the women-specific sub-system (2.0), medical research gender bias as a ceiling on the effectiveness of GP training, and perceived safety in public outdoor space as a sex-specific barrier to physical activity independent of infrastructure availability, were added. The prevalence of dotted arrows across all three validated diagrams constitutes a systemic finding: the gap between formal policy intent and practical effect is not an anomaly confined to specific instruments but a pattern that repeats across actors and domains.

Five recommendations are derived from the analysis, each designed to create accountability for women-specific CVD prevention within existing mandates. VWS should embed sex-disaggregated participation and physical activity indicators in GALA output agreements, making a portion of the specific subsidy allocation (Specifieke uitkering, SPUK) conditional on measurable progress against sex-specific targets in deprived postcodes. National guidance under the Environment Act (Omgevingswet) should require municipalities to include sex-specific urban design criteria, covering lighting, sight lines, route connectivity, and group exercise infrastructure, as explicit requirements in their urban planning. The National Health Care Institute (Zorginstituut Nederland, ZIN) should produce a follow-up Signalement specifically addressing sex-specific cardiovascular risk, providing ZN with the normative basis to extend GLI eligibility to women with polycystic ovary syndrome (PCOS), adverse pregnancy outcomes, or premature menopause without requiring a change to the Zvw framework. GGD-municipality service contracts under the Public Health Act should be extended to include sex-specific smoking cessation reach targets, directing GGD outreach capacity toward female smokers and enabling sex-disaggregated monitoring by the National Institute for Public Health and the Environment (Rijksinstituut voor Volksgezondheid en Milieu, RIVM). Finally, VWS should coordinate an agreement with employer organisations to establish sex-specific CVD risk screening as a standard component of periodic occupational health examinations for women over 40, activating the absenteeism cost logic that Theme 1 identifies as the operative justification for prevention investment among non-health actors.

The multi-actor system diagram contributes to strengthening CVD prevention for women in three distinct ways. First, it makes visible what documentary and epidemiological analysis alone cannot show: the reinforcing feedback loops in sub-systems 2.1 and 2.2 explain why overweight and smoking prevalence persist despite sustained prevention investment, and the prevalence of dotted arrows across all three validated diagrams shows that the gap between policy intent and practical effect is a system-wide pattern rather than an isolated implementation failure. Second, it identifies concrete leverage points within existing actor mandates where women-specific interventions can be operationalised without new institutional structures: LHV can update the NHG cardiovascular risk management (CVRM) guideline to screen women with PCOS, adverse pregnancy outcomes, or premature menopause; ZN can extend GLI eligibility under existing Zvw authority; GGD can deploy a sex-specific cessation programme through GALA; and VNG can direct physical activity infrastructure investment toward areas where women face safety barriers that make existing provision inaccessible in practice. Third, the iterative validation through actor perspectives specifies under what conditions each intervention can succeed, showing for instance that ZN's GLI expansion requires an explicit cost-benefit argument and external pressure from VWS, and that LHV's guideline update will only produce practice change if accompanied by clinical decision aids that reduce rather than add to GP workload.

At the same time, the method has real limitations that qualify this contribution. The diagram represents actors as homogeneous units, while interviewees consistently emphasised that perspectives on prevention differ considerably within organisations and that individual motivation shapes how mandates are used in practice. Governance dynamics such as diffuse ownership of prevention outcomes and informal dependencies between actors proved difficult to capture

through causal arrows between variables. The diagram also cannot adequately model individual behavioural variation: whether a woman participates in a cessation programme or uses a physical activity facility depends on personal circumstances, social context, and motivational factors that a system-level model necessarily flattens. The multi-actor system diagram should therefore be understood as a structured simplification that supports system understanding and makes assumptions explicit, rather than as a complete representation of how the prevention system operates. Its value lies not in the final diagrams alone but in the iterative process of constructing, challenging, and refining them through multiple sources of evidence. Future research should extend the interview sample to include actors in formal system positions, use diagram-based interviewing to enable more targeted validation, develop sex-disaggregated monitoring infrastructure within RIVM's existing prevention framework, and consider system dynamics or agent-based modelling as a next analytical step.

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1. Introduction

1.1 Problem statement and scope

Cardiovascular diseases (CVDs) are the primary cause of death worldwide (World Health Organization, 2025). The prevalence of many cardiovascular risk factors is expected to rise over the next 30 years, making strong clinical and public health strategies essential to manage or reverse these trends (Maddox et al., 2024).

Most CVDs are largely preventable by addressing behavioural and environmental risk factors (World Health Organization, 2025). In the Netherlands prevention is particularly relevant: currently, 1.7 million people live with a CVD, and without additional action this number is projected to rise to 2.6 million within the next decade (Hartstichting, 2024). CVD remains one of the leading causes of death among women, on average, 57 women die each day from heart or vascular disease (UMC Utrecht WKZ Foundation, n.d.). Pérez and Greenfield (2024) estimate that eliminating the cardiovascular disease gap could restore 1.6 million healthy life years for women and generate annual economic benefits.

Gender inequality also plays a significant role in CVD prevention. An umbrella review by Bosomworth and Khan (2023) highlights persistent gender-based disparities in cardiovascular health, showing that women are disadvantaged in risk assessment, prevention, and care. They emphasise the need to better prioritise women through improved awareness and more effective primary and secondary prevention strategies. Supporting this, Hamid et al. (2024) show that women are less likely than men to have their cardiovascular risk factors assessed.

This thesis focuses on CVD prevention policy within the Dutch health system. CVD is one of the leading causes of death in the Netherlands, making effective prevention a key public health priority (Hartstichting, 2024). Within this scope, specific attention is given to adult women, as they are affected by distinct biological and gender-related risk factors that are not always adequately reflected in current prevention policies (PwC, 2026).

1.2 Social relevance

The challenge of CVD prevention for women connects directly to international and national policy ambitions. At the global level, Sustainable Development Goal 3.4 calls for a one-third reduction in premature mortality from non-communicable diseases by 2030, a target to which CVD prevention is central (SDG Nederland, 2025).

At the European level, the European Commission launched the Safe Hearts Plan in 2025 (European Commission, 2025). This is the first coordinated EU strategy targeting cardiovascular disease burden across Member States. The plan explicitly identifies women as a priority population and calls on Member States to strengthen national prevention strategies, including

better understanding of how health systems can support effective prevention (European Commission, 2025).

In the Netherlands, this ambition is reflected in several national agreements. The Integrated Health Agreement (IZA) sets a 25% reduction in cardiovascular disease burden by 2030 as an explicit target (Ministerie van VWS, 2022). The National Prevention Agreement (NPA) commits the Dutch government and societal partners to reducing smoking, problematic alcohol use, and overweight by 2040 (Ministerie van VWS, 2018). The Dutch Heart Foundation has additionally identified prevention and equitable access to cardiovascular care as two of the central challenges for the coming decade (Hartstichting, 2024).

Despite these commitments at multiple governance levels, CVD remains one of the leading causes of death among Dutch women. The gap between policy ambition and prevention outcomes in practice is precisely what this thesis aims to examine.

1.3 Scientific relevance

Effective cardiovascular disease prevention for women requires more than identifying the right clinical interventions. It involves navigating a system of interdependent actors, including government agencies, healthcare providers, municipalities, insurers, patient organisations, and commercial actors, each with their own interests, resources, and responsibilities. These actors operate across different governance levels and policy domains, and their interactions determine whether prevention policy is developed, implemented, or resisted in practice. A smoking tax may trigger cross-border purchasing rather than cessation; a food reformulation agreement may be offset by marketing strategies that sustain unhealthy consumption. No single actor holds the authority or resources to realise effective prevention independently.

What makes this particularly challenging in the Dutch context is that the health system is organised around treating illness, not preventing it. Health insurers reimburse care for patients; hospitals are funded through care production; general practitioners operate under mandates directed at complaint-based consultations (Vanneste et al., 2026). Prevention falls outside these existing responsibilities. Political agreements on prevention can be signed and targets can be set, but no actor in the system is structurally mandated to implement or monitor them. Understanding why Dutch CVD prevention policy does not produce the expected results therefore requires looking beyond the content of policies to the actors who are supposed to carry them out, and asking whether their mandates, incentives, and resources actually align with the prevention objectives those policies set.

Several studies have applied system-oriented methods to CVD prevention and related public health problems, including system dynamics models that simulate the effects of interventions on risk factors over time (Hirsch et al., 2010; Zheng et al., 2025; Wilde, 2007) and causal loop diagrams that map how individual, environmental, and policy-related factors interact to sustain health disparities (Mills et al., 2021). The feedback loop structures identified in these studies

form a part of the analytical basis for the sub-system diagrams developed in Chapter 4. A detailed overview of these studies is provided in Section 2.2.3.

However, these studies represent the system primarily in terms of factors and causal relations, and exclude the actors responsible for implementing, supporting, or resisting the interventions under study. Former American Heart Association (AHA) president Joseph Wu captured the practical implication of this when he stated that progress in cardiovascular health ultimately "comes down to incentives," requiring alignment between doctors, patients, insurers, hospitals, and communities (Cooney, 2024). An approach that maps system factors without identifying who holds responsibility for what, and what incentives they operate under, cannot answer that question. This thesis addresses that gap by applying a multi-actor system diagram (Enserink et al., 2022) that places actors at the centre of the analysis: each actor is represented with explicit resources and goals, making it possible to examine not only what interventions exist, but who is positioned to implement them and whether their incentives align with the prevention objectives those interventions pursue.

1.4 Knowledge gap

The literature demonstrates that substantial knowledge already exists regarding CVD prevention for women. Previous studies have documented gender disparities in cardiovascular risk, prevention, diagnosis, and treatment (Bosomworth & Khan, 2023; Desai et al., 2021; Wang et al., 2023). A growing body of research has translated these insights into women-specific prevention guidelines and policy recommendations (Cho et al., 2020; Kouvari et al., 2020; Shahid et al., 2024). At the same time, research on Dutch prevention policy highlights the importance of addressing structural determinants of health and moving beyond individual behavioural approaches (Vanneste et al., 2026).

Several studies have also adopted system-oriented approaches to investigate complex public health problems. System dynamics models and causal loop diagrams have been used to analyse CVD prevention and its key risk factors, providing valuable insights into feedback mechanisms, intervention effects, and unintended consequences (Hirsch et al., 2010; Mills et al., 2021; Wilde, 2007; Zheng et al., 2025). However, these studies primarily focus on relationships between system factors and the expected effects of interventions. The actors responsible for implementing, supporting, resisting, or adapting to these interventions are generally treated as external to the model or receive limited attention. Conversely, studies applying policy analysis or multi-actor approaches explicitly examine stakeholders and governance arrangements (Barbazzza et al., 2019; Khodayari-Zarnaq & Alizadeh, 2022), but provide less insight into how actor interactions influence the functioning of the broader prevention system over time.

As a result, a gap remains in understanding how actor perspectives, resources, interests, and influence interact with system structures and feedback mechanisms in shaping cardiovascular disease prevention. This is particularly relevant for women's CVD prevention, where effective policy requires coordination between healthcare providers, policymakers, public health

organisations, patient organisations, municipalities, insurers, and commercial actors. To address this gap, this thesis applies a multi-actor system diagram to integrate both system relationships and actor dynamics into a single analytical framework. According to Enserink et al. (2022), a system diagram structures complex policy problems by identifying key system elements, their relationships, and the broader context in which they operate. In doing so, the study not only aims to improve understanding of the Dutch CVD prevention system for women, but also reflects on the usefulness and limitations of the multi-actor system diagram as a method for analysing complex health policy problems.

1.5 Thesis structure

This thesis is organised into nine chapters that follow a sequential, iterative logic in which each chapter builds on the findings of the preceding ones.

Chapter 2 presents a literature review on three intersecting domains: gender inequity in cardiovascular disease prevention, women-specific CVD evidence and clinical guidelines, and system-oriented approaches to CVD prevention policy. The review identifies the knowledge gap this thesis addresses and establishes the scientific foundation for the methods and analytical framework applied in subsequent chapters.

Chapter 3 describes the research design, including the policy analysis perspective adopted, the role of the multi-actor system diagram (Enserink et al., 2022) as the central analytical tool, and the methods and data sources applied at each phase of the research: grey literature review, scientific literature review, actor analysis, iterative system diagram construction, and thematic analysis of semi-structured interviews.

Chapter 4 addresses sub-question 1 by providing a structured analysis of how cardiovascular disease prevention for women is currently organised within the Dutch health system. It examines relevant policy frameworks at the European and national levels, identifies the absence of women-specific provisions across existing frameworks, and analyses the overweight and smoking prevention sub-systems in dedicated sections. The sub-system diagrams constructed for these two risk factors are presented in the appendix.

Chapter 5 addresses sub-question 2 through an actor inventory and formal chart that map the objectives, resources, and institutional relationships of the actors that shape the Dutch CVD prevention system for women.

Chapter 6 addresses sub-question 3 by identifying twelve evidence-based, women-specific policy interventions absent from current Dutch prevention policy and translating four of these into a hypothetical multi-actor system diagram that maps proposed actor means onto the system factors and causal pathways identified in the preceding chapters. This diagram is presented in the appendix.

Chapter 7 addresses sub-questions 4 and 5 through the analysis of seven semi-structured stakeholder interviews. Section 7.1 provides an overview of the sector composition and thematic distribution of the interview sample. Section 7.2 presents the results of the thematic analysis, identifying six themes that characterise how actors perceive the CVD prevention system. Section 7.3 shows how these thematic findings update and validate the system diagrams, producing three revised and empirically grounded final versions.

Chapter 8 provides a discussion of the research, including a reflection on the application of the multi-actor system diagram as a method and an assessment of the study's methodological limitations.

Chapter 9 presents the conclusions of the thesis by answering each sub-question in turn, synthesising the findings into an answer to the main research question, deriving practical policy recommendations for strengthening CVD prevention for women in the Netherlands, and identifying directions for future research.

2. Literature review

2.1 Search strategy

A literature review was conducted to synthesise the state of the art on CVD prevention for women. The review covers three topics: gender inequity in CVD prevention, women-specific CVD prevention evidence and guidelines, and system-oriented approaches to CVD prevention. Search queries were developed for each domain based on its core concepts, with variants and synonyms included to ensure coverage of relevant studies.

Searches were performed in PubMed and Scopus, selected for their complementary coverage of clinical, public health, and policy-relevant literature. The following search strings were applied per domain:

- Gender inequity in CVD prevention: ("cardiovascular disease" OR CVD*) AND (prevention OR preventative) AND (gender OR Women OR "gender inequity" OR "sex differences")
- Women-specific CVD prevention evidence and guidelines: ("cardiovascular disease" OR CVD*) AND ("primary prevention" OR guideline OR screening OR "risk assessment") AND (women OR female OR "sex differences")
- System-oriented approaches: ("cardiovascular disease" OR CVD*) AND (prevention OR preventative) AND ("health policy" OR policy) AND ("multi-actor" OR "actor analysis" OR governance OR "stakeholder analysis" OR "system analysis" OR "system approach" OR "system thinking" OR "system model" OR "system mapping")

Publications were screened on the basis of title and abstract review, with eligibility based on relevance to CVD prevention and gender disparities. Studies focused solely on diagnosis or treatment, or on exclusively male populations, were excluded. Studies from geographical contexts not directly comparable to the Netherlands were included where they offered methodological relevance, particularly in the domain of system-oriented approaches, where few European studies exist. No strict publication year cutoff was applied, though more recent literature was prioritised where multiple studies addressed the same question

2.2 Literature synthesis

The following synthesis is organised across three domains that together establish the knowledge context for this thesis. The first two domains concern what is known about gender disparities in CVD and the evidence base for women-specific prevention. The third domain reviews how system-oriented approaches have been applied to CVD prevention problems, identifying where actor dynamics have been underexplored.

2.2.1 Gender inequity in CVD prevention

Recent reviews and empirical studies clearly demonstrate gender disparities in CVD prevention to the detriment of women. Bosomworth and Khan (2023) provide an umbrella review showing

"undeniable gender-based inequality" in CVDs. Women are under-represented in studies, under-recognised in clinical practice, and undertreated in both primary and secondary prevention. They argue that women are still not given equal consideration in risk assessment and management and call for women to be explicitly prioritised through greater awareness, improved prevention, and the development of gender-specific clinical guidance. Desai et al. (2021) similarly researched sex differences in prevention, investigation and management, with women often receiving less aggressive and later preventive strategies than men. They highlight that persistent misconceptions, including the idea that estrogen protects women from CVD, combined with higher prevalence of metabolic syndrome and female-specific risk factors (e.g. pregnancy-induced hypertension, gestational diabetes, polycystic ovary syndrome, menopause) create a distinct risk profile that is not adequately addressed in current prevention policies.

Evidence from Wang et al. (2023) illustrates that sex disparities in CVD prevention are complex and heterogeneous: some indicators suggest better primary prevention among women, but this advantage disappears or reverses after adjusting for metabolic risk, and clear gaps remain in secondary prevention medication use. Their findings underline that factors embedded in clinical norms, risk assessment frameworks, and care delivery practices continue to shape prevention uptake and outcomes.

These documented disparities in risk recognition, clinical attention, and prevention uptake form the epidemiological baseline for this thesis: they establish that women face systematically different prevention trajectories, and that this is not adequately reflected in current policy or practice.

2.2.2 Women-specific CVD prevention evidence & guidelines

Recognition of CVD as the leading cause of death among women declined from 65% in 2009 to just 44% in 2019, while traditional risk assessment tools such as the ASCVD Risk Score do not adequately account for sex-specific risk factors and are not designed for women under 40 (Gulati, 2023). In Dutch primary care specifically, Kiss et al. (2024) found in a study of 83,903 patients that women with elevated cholesterol were 13% less likely than men to receive lipid-lowering treatment, rising to 37% less likely in the 40 to 50 age group. A related study found that women were 31% less likely to have their statin dosage uptitrated, with the authors identifying both sex-specific risk scoring that systematically underestimates women's risk and provider-level implicit bias as underlying causes (Kiss et al., 2025). These patterns of clinical undertreatment are compounded by what Gulati (2023) terms clinical inertia: even when women are identified as at elevated risk, they are less likely than men to receive adequate treatment for hypertension, dyslipidaemia, and diabetes.

A distinct category of sex-specific risk concerns adverse pregnancy outcomes. Major guidelines, including the 2018 and 2019 AHA recommendations, now designate a history of hypertensive disorders of pregnancy (HDP) and preeclampsia as risk-enhancing factors for future CVD, yet systematic postpartum surveillance remains absent in most health systems (Lee & Lee, 2025). Up to 60% of maternal deaths occur within the first year postpartum, and long-term guidance for managing women after HDP is lacking (Lee & Lee, 2025). Polycystic ovary syndrome (PCOS)

and premature menopause constitute additional sex-specific risk-enhancing factors that are insufficiently integrated into standard cardiovascular risk stratification (Shahid et al., 2024). Wang et al. (2023) recommend integrating CVD risk screening into existing reproductive health contacts, such as contraception visits and prenatal care, as a way to identify women at elevated risk through contact points that already exist.

For behavioural risk factors, the evidence on effective cessation support for women diverges substantially from generic approaches. A study of 709 female smokers participating in a government outreach programme found that the number of counselling sessions completed in the first four weeks was the strongest predictor of abstinence at six months, making intensive early support a critical component of any women-specific cessation programme (Suh et al., 2023). Regular exercise was a further significant determinant, making women 3.02 times more likely to achieve long-term abstinence, likely by addressing post-cessation weight gain and mood deterioration, which Suh et al. (2023) identify as the primary barriers to sustained abstinence among female smokers.

Physical activity promotion and lifestyle intervention for women require structural as well as individual approaches. Community-based programmes that invest in safe physical activity infrastructure, including cycling paths, walkable neighbourhoods, and accessible sport facilities, have increased leisure-time physical activity among women in intervention settings (Ndejjo et al., 2021). For obese women of childbearing age, lifestyle interventions combining physical activity, nutritional education, and psychosocial support produce measurable improvements: an average weight loss of 3.47 kg, improved lipid profiles, and recovery of spontaneous ovulation with as little as 5% weight reduction (Nho, 2017). Given that obese women are three times more likely to experience infertility and face compounding hormonal risks including PCOS, Nho (2017) concludes that lifestyle programmes for this group constitute an essential model for disease prevention, particularly when eligibility criteria are broadened beyond BMI alone to account for reproductive risk.

At the systemic level, translating this evidence into accessible care requires both financial and organisational reform. Gaffey et al. (2025) argue that effective CVD prevention for women requires robust payer support to sustain new clinical workflows, including the integration of reproductive health histories into routine cardiovascular risk assessment and the embedding of multidisciplinary care models that address social, psychological, and biological risk factors simultaneously. Wang et al. (2023) identify a significant gap between existing clinical recommendations and tangible policy, with most focused prevention programmes remaining concentrated in the United States. Mandating sex-disaggregated data collection and culturally adapted outreach for women from minority and low-SES backgrounds are identified as foundational conditions for equitable prevention (Wang et al., 2023; Gaffey et al., 2025).

The evidence reviewed in this section provides the clinical and policy basis for Chapter 6, which identifies which of these interventions are absent from the current Dutch CVD prevention system and translates four of them into a multi-actor system diagram.

2.2.3 System-oriented approaches to CVD prevention policy

Obesity and smoking are the two CVD risk factors most prominently addressed in Dutch prevention policy and form the focus of the sub-system analysis developed in Chapter 5. Several studies have applied system dynamics (SD) modelling and causal loop diagrams (CLDs) to analyse these and related public health problems, capturing feedback dynamics and unintended consequences that conventional policy evaluation cannot detect.

For obesity, Zheng et al. (2025) systematically reviewed the application of SD modelling in obesity interventions and identified 30 studies using this approach. These studies show that traditional intervention strategies emphasizing individual lifestyle changes fail to address the complex, systemic nature of obesity, which is shaped by lifestyle, socio-economic, environmental, and policy-related factors operating in feedback with one another. Zheng et al. (2025) conclude that SD modelling has significant potential to enhance the effectiveness of obesity interventions and to optimise resource allocation. Of the 30 studies, only six focused specifically on prevention rather than treatment. The causal loop structures identified across these studies directly inform the obesity sub-system diagram developed in Chapter 5.

For tobacco control, Wilde (n.d.) demonstrates that SD modelling moves beyond simple cause-and-effect analysis by capturing feedback loops, delays, and what he terms policy resistance: the tendency of systems to negate interventions through internal counteractions. In tobacco control specifically, control efforts may trigger counter-responses from the tobacco industry, such as strategic pricing and product promotion to maintain smoking prevalence. Wilde's simulations further revealed that reducing smoking initiation among adolescents and adults produced far greater long-term declines in prevalence than equivalent reductions among children under twelve, illustrating how system models generate non-obvious insights for policy prioritisation. Mills et al. (2021) extend this using a CLD with 24 constructs spanning individual factors (such as cravings and stress), environmental factors (including tobacco marketing and zoning laws), and fundamental drivers (such as low-wage work and housing instability). They identify tobacco companies' profit maximisation and structural racism as the most influential drivers in the system, each with the highest number of outgoing causal relationships. Their analysis reveals specific unintended consequences: smoke-free housing policies, while intended to normalise non-smoking behaviour, can increase housing instability and financial strain for low-income smokers, which in turn increases stress and smoking as a coping mechanism, creating a reinforcing loop that amplifies rather than reduces smoking. The feedback structures from both studies are directly incorporated into the smoking sub-system diagram in Chapter 4.

Research applying system-oriented methods specifically to CVD prevention provides further analytical grounding. Hirsch et al. (2010) developed an SD model for CVD prevention planning in El Paso County and found that without new interventions, CVD events were projected to increase by 58% and CVD deaths by 77% between 2003 and 2020. Their simulations showed that combining lifestyle, environmental, and medical interventions produced the greatest reduction in CVD events, but required a 30% increase in primary care capacity. A more feasible

strategy combining lifestyle programmes with targeted post-CVD care achieved 85 to 86% of that benefit while requiring only a 12 to 13% increase in capacity, and lifestyle and environmental interventions accounted for 77 to 79% of the benefit in the non-CVD population. Smit et al. (2017) applied individual-based modelling to CVD prevention in the Dutch context, using data from 8,791 patients in the ATHENA cohort. Their model showed that targeting only 14 to 32% of the population identified as high-risk could avert 80% of the CVD events achievable by intervening across the entire population, demonstrating the efficiency gains of risk-stratified approaches.

Khodayari-Zarnaq and Alizadeh (2022) analysed the CVD prevention policymaking process in Iran using Walt and Gilson's policy analysis triangle and found that despite the presence of national frameworks, CVD incidence continued to rise due to insufficient intrasectoral cooperation and the absence of a clear operational framework for implementation. Barbazza et al. (2019) demonstrated the value of an explicit multi-actor approach to CVD prevention in Kazakhstan, simultaneously targeting four actor groups, patients, healthcare professionals, facility managers, and policymakers, with tailored interventions. The approach produced improved cardiovascular risk assessment coverage, reduced hospitalisation rates, and a shared culture of learning among actors. The authors note, however, that a highly prescriptive national regulatory framework frequently stifled the clinical and managerial autonomy that the intervention sought to foster. Oguta et al. (2025) reviewed 27 decision analytic models for CVD prevention in Sub-Saharan Africa and found that pharmacological interventions were the most frequently modelled, while lifestyle interventions remained underrepresented despite being classified as WHO best buys. Only seven studies incorporated equity dimensions, and the authors identify a pressing need for primordial prevention research.

Taken together, these studies demonstrate the value of system-oriented methods for understanding prevention problems. However, they primarily represent the system in terms of factors and causal relations, and do not explicitly focus on CVD prevention for women or on the multi-actor policy dynamics that determine whether interventions are implemented in practice. The feedback loop structures from Zheng et al. (2025), Wilde (n.d.), and Mills et al. (2021) are adapted in Chapter 5, while Barbazza et al. (2019) and Khodayari-Zarnaq and Alizadeh (2022) demonstrate that explicitly centring actors and their coordination arrangements is analytically productive for CVD prevention problems.

3. Research Design and Questions

3.1 Research approach

3.1.1 Policy analysis and complex multi-actor problems

This thesis adopts a policy analysis perspective to examine CVD prevention for women in the Netherlands. Policy analysis is a scientific discipline that emerged in the post-war period and has since broadened well beyond its origins in operations research and systems analysis to incorporate insights from political science, sociology, and the behavioural sciences (Dunn, 1994). Rather than providing direct solutions, it applies analytical tools to structure complex problems, explore alternative courses of action, and generate knowledge that is useful in policy debates (Majone, 1989; Enserink et al., 2022).

The prevention of CVD among women in the Netherlands constitutes such a policy problem. Despite substantial scientific evidence demonstrating the effectiveness of preventive interventions and growing awareness of sex-specific cardiovascular risk factors, CVD remains one of the leading causes of death among Dutch women, creating a clear gap between the current situation and the desired situation in which CVD is prevented more effectively and equitably. Addressing this gap involves difficult choices regarding responsibilities, funding, regulation, and implementation, creating a policy dilemma.

Policymaking on complex health issues like CVD prevention is rarely a linear or centrally directed process. Rather than unfolding as a sequence of rational decisions by a single authoritative actor, it is better understood as a continuous and iterative cycle in which agenda setting, decision-making, implementation, and evaluation interact over time (Dunn, 1994; Enserink et al., 2022). Dutch CVD prevention policy is currently situated in the policy impact phase: major agreements such as the National Prevention Agreement (NPA), the Integrated Health Agreement (IZA), the Healthy and Active Life Agreement (GALA), and the Additional Health and Wellbeing Agreement (AZWA) have been developed and implemented, yet RIVM evaluations demonstrate that current measures are insufficient to achieve long-term prevention targets, particularly regarding smoking and obesity (Kuijpers et al., 2023; Eykelenboom et al., 2023). Some interventions directly affect the interests of actors such as the tobacco industry, food industry, and hospitality sector, generating opposition and resistance in both the preparation and implementation phases (Mayer, 1997).

A central characteristic of such complex policy settings is that resources, authority, and information are distributed across multiple actors rather than concentrated in a single decision-maker. When the government neglects these actors in policymaking, it risks a lack of support or even active opposition, as the resources needed for implementation may become unavailable (Mayer, 1997). The result is what Van de Riet (2003) describes as multi-actor complexity: "a situation in which both divergent interests and divergent perceptions of reality shape how different actors understand the problem and what solutions they consider acceptable." These divergent perceptions stem from actors' different values, roles in society,

and frames of reference through which they interpret a problematic situation (Schön and Rein, 1993). Effective policy analysis in such settings must therefore not only generate scientifically valid knowledge, but also account for all relevant actor interests and adopt a multi-perspective approach that makes different problem framings explicit.

3.1.2 Cardiovascular disease prevention as a complex multi-actor system

A central assumption of this thesis is that CVD prevention should not be understood as a linear policy problem but as a complex multi-actor system. According to Enserink et al. (2022), complex policy problems are characterised by technical, social, institutional, and normative complexity. Such problems involve multiple actors with different interests, resources, responsibilities, and perceptions of both the problem and its potential solutions.

CVD prevention among women exhibits all of these characteristics. Technical complexity arises from the multifactorial causes of CVD, which include biological, behavioural, environmental, and social determinants. Social complexity emerges because numerous actors are involved, including government agencies, healthcare providers, municipalities, insurers, patient organisations, researchers, and commercial actors such as the tobacco and food industries. Institutional complexity results from the fragmented organisation of prevention across multiple policy domains, governance levels, and funding mechanisms. Normative complexity is present because actors may disagree on what constitutes an acceptable balance between public health objectives, individual responsibility, economic freedom, and healthcare expenditure. No single actor possesses sufficient authority or resources to solve the problem independently, making CVD prevention for women a typical multi-actor policy problem.

3.1.3 Healthcare as a complex adaptive system

The complexity of CVD prevention is further reinforced by the nature of the healthcare system itself. Lipsitz (2012) argues that healthcare systems should be understood as complex adaptive systems rather than mechanical systems. Whereas mechanical systems operate through linear cause-and-effect relationships, complex systems are characterised by nonlinear interactions, feedback mechanisms, adaptation, and emergent behaviour. Healthcare outcomes are produced through interactions between numerous interconnected actors and organisations operating at different scales, including patients, healthcare professionals, hospitals, insurers, public health organisations, and governments. Because these interactions are nonlinear, interventions often generate unintended consequences that cannot be predicted by analysing individual components in isolation. Attempts to control healthcare through isolated regulations, protocols, or financial incentives frequently fail because they overlook these broader system dynamics (Lipsitz, 2012).

This is particularly relevant for prevention policy. Interventions such as smoking taxes, food reformulation agreements, reimbursement of lifestyle interventions, or public awareness campaigns do not operate independently. Instead, they interact with existing institutions, commercial interests, social norms, and behavioural responses, creating feedback effects that shape policy outcomes.

3.1.4 Multi-actor system diagrams as a framework for policy analysis

Given this complexity, this thesis uses a multi-actor system diagram as its primary analytical framework. According to Enserink et al. (2022), system diagrams structure complex policy problems by identifying relevant system elements, actors, and relationships between them. Rather than simplifying a problem into a single causal chain, a system diagram provides an integrated representation of how actors, institutions, resources, and policy interventions interact within a broader system.

The use of system approaches in public health has gained increasing attention. Stronks et al. (2025) argue that major public health challenges such as obesity, smoking, and health inequalities emerge from complex systems involving interacting mechanisms, feedback processes, and adaptive behaviour, and that understanding these problems requires attention not only to causal mechanisms but also to system dynamics, implementation processes, and interactions between actors. A multi-actor system diagram is particularly suited to this research because it combines these system characteristics with explicit attention to stakeholders, allowing both causal relationships and actor dependencies to be visualised within a single framework.

The suitability of a multi-actor system diagram is not taken for granted. An important objective of this thesis is to examine whether this method is capable of adequately representing the complexity of CVD prevention for women. Rather than producing a single system representation, the diagram is developed iteratively, starting from policy documents and literature and progressively refined through actor analysis and stakeholder perspectives obtained through interviews. This iterative process allows the strengths and limitations of the method itself to become part of the research findings.

3.1.5 The role of actor perspectives

System diagrams provide a formal representation of a policy system, but do not automatically capture how actors perceive that system. Hermans and Cunningham (2018) argue that actors often fail to coordinate effectively not because they disagree on the existence of a problem, but because they hold different beliefs regarding its causes, solutions, and responsibilities. Actors may support the same overall objective while disagreeing fundamentally on how it should be achieved, and understanding these differences can inform more effective policy interventions.

To incorporate these perspectives, this thesis draws on the logic of Comparative Cognitive Mapping as described by Hermans and Cunningham (2018). Interviews are used to explore how actors understand the prevention system, which causal relationships they consider important, and where they perceive barriers or opportunities for change. These insights are subsequently used to refine the multi-actor system diagram, producing a representation that more closely reflects the perceptions and realities of the actors operating within the system.

3.2 Research questions

This section presents the main research question and the five sub-questions that structure the empirical work of this thesis. Together they address both the substantive question of how CVD prevention for women in the Netherlands can be strengthened, and the methodological question of whether a multi-actor system diagram is a suitable tool for analysing this type of complex health policy problem.

3.2.1 Main question

CVD prevention for women in the Netherlands involves a wide range of actors operating across healthcare, public health, government, industry, and civil society, each with their own responsibilities, resources, interests, and perspectives. Translating the available scientific evidence into effective prevention policy remains difficult in this multi-actor context. To analyse this complexity, this thesis uses a multi-actor system diagram as its central analytical framework (Enserink et al., 2022), developed iteratively by combining insights from policy documents, scientific literature, actor analysis, and stakeholder perspectives.

The main research question is:

How can a multi-actor system diagram contribute to strengthening cardiovascular disease prevention policy for women in the Netherlands?

3.2.2 Sub-questions

In order to answer the main research question, five sub-questions are developed. These questions provide insight into the CVD prevention problem and at the same time examine the multi-actor system diagram as a suitable method for this type of problem.

1. *How is cardiovascular disease prevention for women currently organised within the Dutch health system?*

Before analysing how prevention policy can be strengthened, it is necessary to understand the existing system in which prevention takes place. This sub-question addresses how CVD prevention for women is currently formally organised: which policy frameworks, governance structures, actors, and instruments shape it, and to what extent women are explicitly considered within existing arrangements. The findings form the baseline on which the actor analysis, intervention identification, and stakeholder perspectives in the subsequent chapters build.

2. *Which actors shape the Dutch CVD prevention system for women?*

CVD prevention for women is not determined by a single organisation or policy programme but emerges from interactions between a wide range of actors with different objectives, responsibilities, resources, and degrees of influence. This sub-question identifies which actors

hold the authority, means, and capacity to implement specific prevention interventions, making it possible to translate evidence-based recommendations into an actor-assigned system diagram. This translation is essential for understanding not only what should change in the prevention system, but which actors would need to act and what the expected systemic effects of those actions would be.

3. Which policy interventions can be identified to strengthen CVD prevention for women within the Dutch health system?

Understanding the actor landscape alone is insufficient to understand how the system can be strengthened. This sub-question identifies which evidence-based, women-specific policy interventions are available but currently absent from Dutch prevention policy. Because actors differ in their responsibilities, authority, and capacity, not all interventions are equally relevant for all actors. This sub-question provides the link between the actor landscape and the broader system analysis by assigning identified interventions to specific actors within the diagram.

4. How do actors perceive the system of CVD prevention for women?

Policy documents describe intended responsibilities, relationships, and expected outcomes, but provide limited insight into the practical challenges, informal dynamics, and day-to-day realities that influence implementation. This sub-question explores how actors perceive the CVD prevention system for women, providing insight into how the system operates in practice and whether the formal representation corresponds with actors' experiences. The gap between intended and actual system behaviour cannot be observed through policy documents alone, and the perspectives gathered here provide the empirical basis for the validation and updating of the system diagrams addressed in the fifth sub-question.

5. How do actor perspectives update and validate the understanding of the Dutch CVD prevention system for women?

Collecting actor perspectives is not an end in itself. This sub-question focuses on how those perspectives improve the system understanding developed in the previous sub-questions: which assumptions are confirmed, which relationships need revision, and what the interviews reveal that policy documents and literature did not capture. Answering this sub-question results in a more practice-informed representation of the Dutch CVD prevention system for women, and provides the basis for reflecting on the strengths and limitations of the multi-actor system diagram as a method.

3.2.3 Research flow

This thesis follows an iterative research approach in which the multi-actor system diagram is progressively developed, refined, and evaluated across five phases (Figure 3.1).

The first phase establishes how CVD prevention for women is currently organised in the Dutch health system. A grey literature review of policy documents and governance reports produces

an initial system diagram (version 0.0) representing the system as described in formal policy documents, followed by a reflection on the strengths and limitations of this initial representation.

The second phase identifies the actors that shape the Dutch CVD prevention system. Relevant actors are mapped in terms of their objectives, formal responsibilities, and available resources, resulting in an actor inventory table and a formal chart of institutional relationships.

The third phase identifies which evidence-based, women-specific policy interventions are absent from current Dutch policy. A scientific literature review produces an overview of interventions assigned to specific actors, incorporated into a second system diagram (version 1.0) that models how the system could function if selected interventions were adopted.

The fourth phase incorporates actor perspectives through semi-structured interviews with seven actors across four sectors. Transcripts are analysed using thematic analysis, and the resulting insights are used to update and validate the system diagrams, producing three final versions (2.0, 2.1, and 2.2) that reflect both formal policy arrangements and practice-based experience.

The fifth phase synthesises the findings across all phases, comparing successive diagram versions to examine how the understanding of the prevention system evolved, and drawing conclusions on both CVD prevention for women and the suitability of the multi-actor system diagram as a policy analysis method.

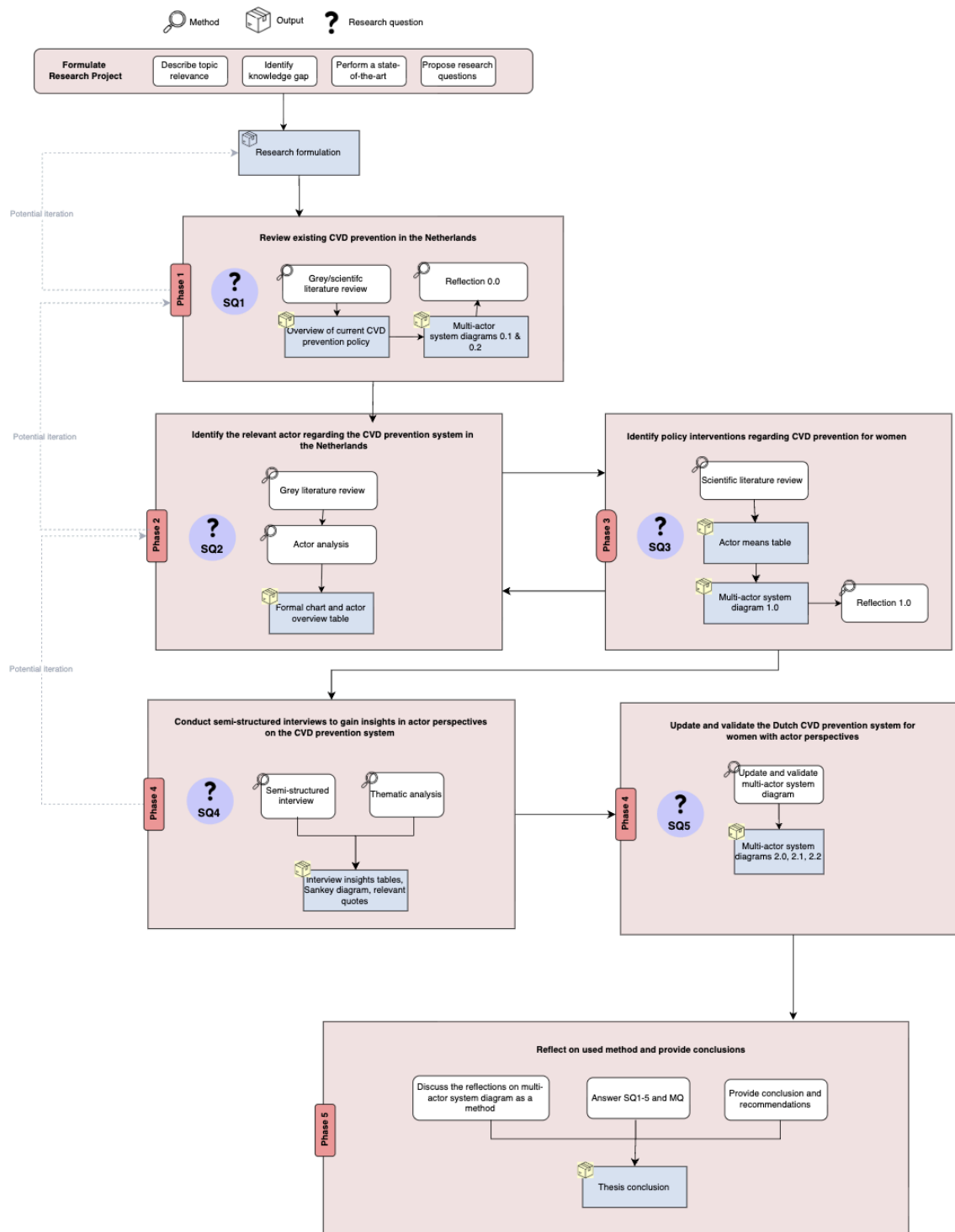


Figure 3.1: Research flow (own work inspired by Bhatta et al. (2021))

3.3 Methods and data sources

This research draws on five distinct methods applied in sequence across the research phases described in Section 3.2.3. Each method addresses one or more sub-questions and contributes a specific type of evidence to the iterative development of the multi-actor system diagram. The methods are not independent: findings from each phase inform the next, and all are integrated through the successive diagram versions that form the analytical core of the thesis.

3.3.1 Grey literature review

To answer sub-question 1, a grey literature review was conducted to develop a structured understanding of how CVD prevention for women is currently organised within the Dutch health system. The purpose of this review is not to evaluate policy effectiveness, but to identify the existing prevention landscape: the policy frameworks, governance structures, actors, instruments, and formal relationships that constitute the current system.

The review focuses on policy documents, governmental reports, evaluation studies, and strategic publications from organisations involved in prevention policy. Sources were identified through targeted searches in Google using search terms including "cardiovascular disease prevention Netherlands," "Nationaal Preventie Akkoord," "GALA," "IZA," "AZWA," "vrouwen hart-en vaatziekten beleid," and "CVD prevention Dutch health system." Additional sources were identified through snowball referencing from initially retrieved documents.

Documents were included if they concern CVD prevention or a directly relevant risk factor (overweight, obesity, or smoking) within the Dutch or European policy context; were produced by or on behalf of a governmental body, national health organisation, or recognised policy institution; and were available in Dutch or English. Documents focusing exclusively on clinical treatment rather than prevention were excluded.

Key documents informing the analysis include the National Prevention Agreement (NPA, 2018), the Integrated Care Agreement (IZA), the Healthy and Active Life Agreement (GALA), the Additional Health and Wellbeing Agreement (AZWA), the Zorginstituut Nederland The Heart for Vessels report (2023), the Hartstichting National Heart and Vascular Agenda (2024), RIVM impact assessments of the NPA (2023, 2024), the European Commission Safe Hearts Plan (2025), and a multi-stakeholder roundtable report on cardiovascular health in the Netherlands (PwC, 2026). The findings provide the basis for system diagram version 0.0 and sub-system diagrams 0.1 and 0.2.

3.3.2 Scientific literature review

A scientific literature review was conducted to serve two purposes: to identify academic literature on Dutch CVD prevention policy that contextualises the grey literature analysis in Chapter 4, and to identify evidence-based, women-specific policy interventions that are currently absent from Dutch prevention policy, addressed in Chapter 6.

Dutch prevention policy literature

To identify academic literature on Dutch CVD prevention policy, a targeted search was conducted in PubMed and Scopus using the following search string:

(netherlands OR dutch) AND ("cardiovascular disease" OR CVD) AND (prevention OR preventative) AND ("health policy" OR policy)*

Sources were screened on the basis of relevance to CVD prevention policy in the Dutch context. Studies focused exclusively on clinical treatment, diagnosis, or non-Dutch settings without direct relevance to the Netherlands were excluded. The resulting literature is integrated into Chapter 4 alongside the grey literature review, providing academic grounding for the contextual analysis of the Dutch prevention landscape.

Women-specific policy interventions

To answer sub-question 3, a separate search was conducted to identify evidence-based policy interventions that may contribute to strengthening CVD prevention for women and that are currently absent from Dutch prevention policy. The aim is not to evaluate clinical effectiveness in detail, but to identify interventions that have been proposed, studied, or implemented in comparable settings and that could plausibly be assigned to actors within the Dutch CVD prevention system.

A primary search was conducted in Google Scholar using the query "CVD prevention policy interventions for women," supplemented by more targeted searches on sex-specific smoking cessation strategies and lifestyle interventions for women with overweight. Additional sources were identified through snowball sampling from retrieved articles and systematic reviews.

Interventions were selected based on three simultaneous criteria. First, the intervention must be women-specific: it must target biological or social factors that apply specifically to women, or address a documented gender gap in cardiovascular care that a generic intervention does not resolve. Second, the intervention must be policy-level: it must be deployable by an actor present in the formal actor chart developed in Chapter 5, meaning it cannot rest on individual clinical decisions alone but requires an organisational or institutional actor to initiate or fund it. Third, the intervention must be currently absent from Dutch prevention policy as organised under the NPA, IZA, and GALA: interventions already formally embedded in the Dutch system were excluded.

This process produced twelve evidence-based interventions across three domains: sex-specific CVD risk identification in primary care, direct behavioural prevention targeting smoking and overweight among women, and systemic improvements in coverage and data. Four of these twelve interventions met all selection criteria with sufficient specificity to be translated into actor-assigned means within system diagram 1.0. The full overview of all twelve interventions is provided in Appendix D; Chapter 6 focuses on the analytical translation of the four diagram interventions.

3.3.3 Actor analysis

To answer sub-question 2, an actor analysis is conducted following the multi-actor perspective described by Enserink et al. (2022). The purpose of this step is to identify the actors that influence, implement, support, or are affected by CVD prevention policy for women in the Netherlands, and to understand their position within the broader governance context.

For each actor, information is collected on three analytical dimensions. First, the actor's primary objectives: the outcomes the actor seeks to achieve, as stated in its mission, mandate, or strategic documentation. Objectives provide insight into an actor's interests and motivations within the prevention system and make it possible to identify where actor goals overlap, complement, or conflict with one another. Second, the actor's formal responsibilities: the legal or institutional role the actor holds within the Dutch health system, including mandates derived from legislation such as the Zorgverzekeringswet (Zvw). Third, the actor's resources: the means through which the actor can influence the system. Resources may include financial capacity, legal authority, expertise, implementation infrastructure, political influence, or network access. Following Enserink et al. (2022), these resources determine which means are credibly available to each actor and therefore which interventions can realistically be assigned to them within the system diagram.

The actor inventory distinguishes between cooperative actors, whose objectives are broadly aligned with CVD prevention goals, and conflict actors, whose commercial or institutional interests are structurally in tension with those goals. This distinction is analytically important because conflict actors do not merely fail to support prevention; they actively deploy resources to resist or counteract it, creating dynamics that the system diagram must represent explicitly.

Following the inventory, the identified actors are visualised in a formal chart. According to Enserink et al. (2022), a formal chart maps the institutional structure of a policy domain by depicting hierarchical relationships, accountability arrangements, and formal coordination mechanisms between actors. The chart represents the system as formally organised, not as it functions in practice; informal dynamics, implementation gaps, and actor perceptions are addressed in the subsequent interview phase.

All actor information is drawn from publicly available sources, including organisational websites, statutory documents, policy agreements, and strategic reports, rather than from self-reported data.

3.3.4 Multi-actor system diagram

The multi-actor system diagram forms the central analytical method of this research. Following Enserink et al. (2022), the diagram structures the complexity of the CVD prevention system by simultaneously representing actors, system factors, policy instruments, causal relationships, and feedback dynamics within a single visual framework. This integration makes visible how the means deployed by different actors interact with the broader system in which they operate,

including reinforcing dynamics, unintended consequences, and conflicts that single-actor or single-instrument analyses cannot detect.

The diagram is constructed using a standardised set of elements. Actors are represented with their associated means (the policy instruments, investments, or actions they deploy) and goals (the outcomes they aim to influence). Internal system factors are variables shaped by actor means or other system factors that in turn influence downstream outcomes. External factors operate from outside the system boundary and shape internal dynamics without being amenable to direct policy intervention. Causal relations are represented as directional arrows annotated with a sign indicating whether the relation is positive or negative. Feedback loops are identified where causal chains form closed cycles, creating self-reinforcing or self-correcting dynamics.

The evidential basis of each causal relation is documented through a colour and line-type convention. Black arrows represent relationships formally established in policy documents. Blue arrows represent relationships supported by scientific or evaluation literature. Red arrows represent assumed relationships for which neither policy documents nor scientific literature provide direct empirical confirmation. Striped arrows indicate relationships where the causal mechanism is formally intended but has not been confirmed as effective in practice, or where a time delay attenuates the effect. Green arrows are introduced in the final diagram versions following the interview phase: solid green arrows represent new relationships introduced on the basis of interview evidence, while dotted green arrows represent previously assumed relationships validated by interviewees as operating below their intended effect in practice.

The diagram is developed iteratively across six versions. Version 0.0 provides a high-level overview of the national CVD prevention system. Versions 0.1 and 0.2 develop sub-system diagrams for overweight and obesity and smoking prevention respectively. Version 1.0 extends the analysis to a hypothetical diagram of women-specific policy interventions. Versions 2.0, 2.1, and 2.2 integrate the interview findings to produce validated and updated representations of all three sub-systems. The full causal relation tables for each version are provided in Appendix B.

3.3.5 Semi-structured interviews

To answer sub-questions 4 and 5, semi-structured interviews were conducted with actors involved in CVD prevention policy. Semi-structured interviews are appropriate when the researcher seeks both thematic comparability across interviews and sufficient flexibility for respondents to elaborate on topics they consider important (Hussein, 2022). The structure is provided by a topic guide and, implicitly, by the analytical categories embedded in the multi-actor system diagram; within this structure, participants are free to speak from their own frames of reference and to introduce topics and connections the researcher may not have anticipated, thereby limiting the risk of confirmation bias.

Interview design

Interviews were conducted with a topic guide covering seven thematic areas. For each topic, the relevant sub-topics explored during the interview are listed in Table 3.1. The sequence and depth of coverage varied per interview, consistent with the semi-structured format.

Prior to and during the interviews, the researcher maintained a mental model based on the multi-actor system diagram developed in Chapters 4 and 6. This model was not shared with participants, and the system diagrams were not shown during the interviews, in order to avoid anchoring participants' responses to the researcher's existing system understanding. Participants were invited to describe the system as they experience it from their own position.

Table 3.1: Topic guide for semi-structured interviews on the Dutch CVD prevention system for women

Topic	Sub-topics
Background and role	• Professional background and current position • Experience with CVD prevention or health policy • Relationship to the Dutch CVD prevention system
Current organisation of CVD prevention	• Overall organisation of CVD prevention in the Netherlands • Influence of national agreements (NPA, GALA, IZA) on prevention • Translation of national policy into local or institutional practice • Role and mandate of the interviewee's own organisation
Stakeholders and goals	• Key actors in the CVD prevention system • Goals and interests of different actors • Conflicting interests or tensions between actors • Actors who benefit from prevention; actors who may experience disadvantages
Challenges	• Gaps or failures in the current prevention system • Gap between policy goals and implementation in practice • Influence of professional cultures, organisational structures, or institutional barriers • Challenges specific to CVD prevention for women
External influences on prevention	• External societal developments affecting prevention (e.g., SES, ageing population) • Influence of EU-level policy frameworks (e.g., Safe Hearts Plan) • Economic and funding constraints as contextual factors
Individual behaviour and citizens	• Role of individual behaviour in CVD prevention • How prevention interventions aim to influence behaviour • Appropriate stage and form of citizen involvement in prevention

Opportunities and recommendations	• Changes needed to improve CVD prevention policy • Actors that could play a stronger or different role • Opportunities for strengthening women-specific CVD prevention • Policy interventions perceived as most promising
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Participant selection and overview

Participants were selected using purposive sampling, targeting actors whose organisational roles place them within or in close proximity to the Dutch CVD prevention system as mapped in Chapter 6. Selection criteria included active involvement in CVD prevention, public health policy, primary care, urban environment, or health-related industry, and the ability to speak to the system-level dynamics of prevention from a supportive, implementing, or conflicting position. Participants were approached primarily via the researcher's professional network at Rypple using email; one participant was approached directly by the researcher. A total of 16 candidates were approached; 10 responded and 7 agreed to participate. All participants provided informed consent for audio recording and for the use of their interview data in anonymised form (Approved by Human Research Ethics Committee TU Delft, 7042) .

Table 3.2 provides an overview of all interviewees, including their reference IDs and organisational affiliations. Interview reference IDs (I1 through I7) are used throughout this thesis when attributing quotations or analytical observations.

Table 3.2: Overview of interview participants

Reference ID	Organisation	Role / function
I1	Ministry of Health, Welfare and Sport (VWS)	Policy advisor (multidisciplinary background in the healthcare sector)
I2	Private sector, architecture and urban planning	Urban planner
I3	Healthcare sector	Medical professional
I4	Tobacco industry	Industry lobbyist
I5	Local health initiative	Prevention programme representative
I6	Private sector, health start-up	Entrepreneur (sugar-free drink start-up)

17	Youth health initiative	Programme representative
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The interview design was developed and documented in accordance with the 32-item Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist (Tong et al., 2007); the full overview is provided in Appendix C.

3.3.6 Thematic Analysis

Interview transcripts were analysed using thematic analysis following the six-phase framework of Braun and Clarke (2006), as operationalised by Ahmed et al. (2025). All interviews were audio-recorded with participants' prior consent and subsequently transcribed verbatim. Interviews were conducted online via video call and ranged in duration from approximately 45 to 75 minutes. Coding was carried out by a single researcher using Atlas.ti software to organise and manage the analytical process.

A hybrid deductive-inductive coding strategy was applied. Initial codes were generated inductively from the interview transcripts, allowing themes to emerge from participants' own framings and priorities (Ahmed et al., 2025). The multi-actor system diagram developed in Chapters 5 and 7 simultaneously served as a structural interpretive lens, enabling the researcher to connect emergent themes to system elements already identified in the literature and policy review. This combination allowed the analysis to remain grounded in the data while maintaining analytical coherence with the broader research framework. The six phases of the analysis were as follows: (1) familiarisation with the data; (2) generating initial codes; (3) searching for themes; (4) reviewing themes; (5) defining and naming themes; and (6) writing up findings. A total of 170 coded fragments were generated across all interviews, which were subsequently grouped into six overarching themes. A full overview of all codes and their theme assignments is provided in Appendix D.

With respect to data saturation, a differentiated assessment is necessary. For actors oriented toward a healthier society (I3, I5, I7), thematic patterns stabilised across interviews and saturation can be considered reached within this group: their perspectives on system barriers, coordination failures, and the conditions for sustainable prevention converged sufficiently to support analytical conclusions. However, saturation was not reached for conflicting actors, such as the tobacco and commercial food industries, nor for the policy and health system actors identified in the actor inventory in Chapter 6. The interviews conducted with these actor categories (I4 and I1 respectively) provided valuable initial insight into their system positions and framings, but were insufficient to fully capture the diversity of perspectives within these groups. Reaching saturation across all relevant actor categories would require a substantially larger number of interviews, particularly with actors who hold conflicting interests or operate at the policy level. This was not feasible within the scope and timeframe of this research. Accordingly, the interview findings are best understood as providing an initial, system-level reading of actor perspectives rather than a comprehensive account of all positions within the

Dutch CVD prevention system. Recommendations for more targeted follow-up research with these actor groups are discussed in Section 9.3.

The resulting themes are used in Chapter 7 to validate, refine, and update the multi-actor system diagram. In this way, the final diagram integrates insights from grey literature, scientific literature, actor analysis, and stakeholder perspectives, producing a more practice-informed representation of the Dutch CVD prevention system for women.

4. Current CVD Prevention Policy in the Netherlands

This chapter addresses Sub-question 1: *how is cardiovascular disease prevention for women currently organised within the Dutch health system?* The chapter proceeds in four sections. Section 4.1 describes the European policy context. Section 4.2 maps the national policy landscape, covering the four main policy agreements, relevant strategic policy reports, and the absence of women-specific provisions across these frameworks. Sections 4.3 and 4.4 examine current Dutch policy for the two CVD risk factors most relevant to women's cardiovascular risk: overweight/obesity and smoking. The grey and academic literature underlying this chapter is described in Sections 3.3.1 and 3.3.2.

4.1 European level

At the European level, CVD prevention has recently become an explicit strategic priority through the Safe Hearts Plan, launched by the European Commission in 2025. The plan is the first coordinated European approach to cardiovascular disease, which affects approximately 62 million people across the EU, causes around 1.7 million deaths annually, and imposes an economic burden exceeding €282 billion each year (European Commission, 2025). The European Commission (2025) estimates that nearly 80% of CVD cases can be prevented by addressing modifiable risk factors, and the plan therefore adopts a life-course approach to prevention across all stages of life.

Importantly, the Safe Hearts Plan explicitly identifies women as a group requiring targeted attention, recognising persistent gender inequalities in cardiovascular prevention, diagnosis, and treatment across Europe. Although the plan is not legally binding, it provides strategic direction for national prevention policies and establishes that women-specific CVD prevention is a shared European priority (European Commission, 2025).

4.2 National policy landscape

4.2.1 Policy agreements

CVD prevention in the Netherlands is shaped by four national policy agreements. The National Prevention Agreement (NPA, 2018) targets smoking, obesity, and alcohol use through voluntary commitments from government, healthcare, industry, and civil society, with health targets set for 2040. The Integrated Care Agreement (IZA, 2022) aims to integrate prevention into curative healthcare by embedding prevention activities within GP practices and regional health partnerships. The Healthy and Active Life Agreement (GALA, 2023) channels funding to municipalities for local prevention and health promotion, targeting communities with the highest health burdens. The Additional Health and Wellbeing Agreement (AZWA, 2025) extends this by including people at elevated cardiovascular risk as a priority group for scalable interventions and strengthening collaboration between primary care and public health services.

Together these agreements reflect a shift toward prevention as a shared societal responsibility distributed across healthcare, municipalities, insurers, and employers. However, RIVM

evaluations of the NPA demonstrate that current progress is insufficient to achieve the 2040 targets, particularly for obesity and smoking, due to a combination of limited implementation capacity, commercial resistance, and the absence of enforceable accountability mechanisms (Kuijpers et al., 2023; Eykelenboom et al., 2023).

4.2.2 Policy reports

Beyond the policy agreements, two strategic publications shape the national agenda. The Heart for Vessels report by Zorginstituut Nederland (2023) identifies persistent gaps in cardiovascular risk prevention in primary care, including underdiagnosis, low adherence to preventive medication, and insufficient attention to psychosocial and socioeconomic risk factors. The report recommends stronger embedding of prevention in GP practice and improved coordination between primary care and public health. The National Heart and Vascular Agenda (Hartstichting, 2024) calls for a comprehensive national approach that integrates prevention, early detection, treatment, and rehabilitation, with explicit attention to health inequalities and the use of predictive models for targeted prevention.

4.2.3 Lack of women-specific policy

Across both the policy agreements and the strategic reports, a consistent pattern emerges: none of the frameworks explicitly account for sex differences in cardiovascular risk or prevention needs. The NPA, IZA, GALA, and AZWA address smoking, obesity, and physical inactivity in gender-neutral terms, with no provisions for sex-specific risk factors such as adverse pregnancy outcomes, PCOS, or hormonal cardiovascular risk trajectories (PwC, 2026). This is not an oversight specific to the Netherlands. Vanneste et al. (2026) observe that Dutch prevention policy more broadly remains oriented toward individual behavioural change and the reduction of medical risk factors, with insufficient attention to the conditions, living environments, and socioeconomic inequalities that drive health behaviours in the first place. For women, this limitation is compounded: not only are systemic determinants of health underaddressed, but the sex-specific biological and social determinants of cardiovascular risk are absent from policy design entirely.

The absence of women-specific CVD policy in the Netherlands is therefore not incidental but reflects a broader tendency in the Dutch health system to treat prevention as a gender-neutral problem. For women, there two important CVD risk factors: overweight/obesity and smoking, the next section will provide an overview of existing policy in the Netherlands specific for these factors.

4.3 Overweight and obesity prevention policy

An impact evaluation by Eykelenboom et al. (2023) uses predictive modelling to assess whether the Netherlands is on track to meet its 2040 overweight targets. Comparing a baseline trend scenario with realistic and optimistic intervention scenarios, the evaluation concludes that existing NPA measures slightly slow the projected increase in overweight and obesity but are insufficient to achieve national targets. More far-reaching interventions, including pricing

measures for healthy and unhealthy foods and stricter advertising regulations, are identified as necessary for substantial long-term impact.

Within the NPA, overweight is addressed through four clusters of measures. On food labelling and product reformulation, the national government introduced the Nutri-Score label to support healthier consumer choices, though RIVM estimates its effect on BMI is negligible because the label assists product comparison rather than reducing overall calorie intake (Eykelboom et al., 2023). Voluntary reformulation agreements between FNLI and CBL to reduce calories in soft drinks and sugar in dairy products have produced more measurable results, with branded soft drink targets exceeded by 2022. Within the healthcare domain, the Combined Lifestyle Intervention (GLI) has been reimbursed through the Zvw since 2019, providing structured lifestyle support for adults with overweight or obesity. Individual-level outcomes are measurable, but population-level impact remains limited: participation rates are low and access depends on GP referral, which constrains reach among the groups most at risk (Eykelboom et al., 2023; Zorginstituut Nederland, 2023). GALA funding supports municipalities in improving healthy food availability and sport and exercise provision. An RIVM evaluation found that 82% of municipalities report GALA has provided additional impetus to sport and exercise activities (RIVM, 2025), though the effect on population-level overweight reduction is difficult to measure. Finally, school and childcare programmes including the Gezonde School initiative and the JOGG approach target food habits and physical activity among children. Long-term JOGG implementation has been associated with lower overweight rates among children in participating neighbourhoods, though measured BMI effects across programmes remain relatively small.

No NPA overweight measure is explicitly designed with women's CVD risk in mind. The instruments target general population behaviour without differentiating between men and women, leaving the sex-specific relationship between overweight, hormonal biology, and cardiovascular risk unaddressed in current policy.

4.4 Smoking prevention policy

An impact assessment by Kuijpers et al. (2023) evaluates the NPA tobacco measures and finds that they contribute to a statistically significant decline in smoking prevalence, though the long-term NPA ambitions for 2040 remain out of reach under the current policy approach.

The single most effective measure is the gradual increase in tobacco excise taxes. Multiple increases since 2020 have substantially raised cigarette prices, producing measurable reductions in smoking prevalence among both adults and youth. The 2024 increase of 30.7% was associated with a 6.1% reduction in adult smoking prevalence and a 9.2% reduction among youth (Kuijpers et al., 2023). A second cluster of measures targets the visibility and accessibility of tobacco products. Mandatory plain packaging, removal of tobacco from retail display, tightened advertising restrictions, and progressive restrictions on sales points through bans on vending machines and online sales have contributed to the denormalisation of smoking and further reductions in prevalence. VWS additionally mandates smoke-free environments across schoolyards, playgrounds, sports clubs, and childcare settings. Cessation support has been expanded through exemption from the mandatory health insurance deductible since 2020, and

GPs, midwives, and occupational physicians are encouraged to actively discuss smoking with patients. Participation in formal cessation care nonetheless remains low: Kuijpers et al. (2023) find that only 7.4% to 9.3% of smokers attempted to quit using formal care, and long-term cessation success rates remain limited.

Kuijpers et al. (2023) project that smoking prevalence in 2040 will be approximately 10% under full NPA implementation, placing the ambition of near-zero adult smoking prevalence out of reach. A specific ambition exists for smoking during pregnancy: the NPA targets zero smoking among pregnant women by 2040, supported by cessation pathways through midwives and regional care networks. This is one of the few points in current national policy where a female-specific risk pathway receives explicit attention. Outside of pregnancy, no NPA tobacco measure is designed to address the sex-specific barriers to cessation that women face, a gap examined in Chapter 6.

To support the analysis in subsequent chapters, sub-system diagrams were constructed for both risk factors, mapping the actors, means, and causal pathways involved in current prevention policy. Diagram 0.1 covers overweight/obesity and diagram 0.2 covers smoking. Both are provided in Appendix A1 and A2 and served as input for the interview-based system analysis in Chapter 7.

5. Relevant Actors in the Dutch CVD Prevention System

This chapter addresses sub-question 2: *which actors shape the Dutch CVD prevention system for women?* By identifying the objectives and resources of fifteen actors operating across European, national, and municipal levels, and mapping the formal relationships between them. Section 5.1 provides the actor inventory and Section 5.2 presents the formal actor chart. The methodology underlying the actor analysis is described in Section 3.3.3. The actor landscape established in this chapter provides the institutional basis for the intervention design in Chapter 6 and the interpretation of actor perspectives in Chapter 7.

5.1 Actor inventory

Following Enserink et al. (2022), a key step in actor analysis is identifying the objectives and resources of the actors involved in a policy problem. Objectives reflect the outcomes actors seek to achieve and therefore provide insight into their interests and motivations within the system. Resources refer to what actors possess and can deploy to influence decision-making processes and policy outcomes. Enserink et al. (2022) distinguish several types of resources relevant to multi-actor policy settings: information, knowledge and skills, manpower, financial resources, formal authority and legal power, position in the network (access to other actors), legitimacy and moral authority, and organisational capacity (the ability to effectively mobilise and coordinate resources).

Understanding actor objectives and resources is particularly important in multi-actor systems, where no single actor has sufficient authority to solve a problem independently. Policy outcomes emerge through interactions between actors with different interests, responsibilities, and capacities. By identifying these characteristics, it becomes possible to understand potential dependencies, opportunities for collaboration, and sources of conflict within the system.

Table 5.1 provides an overview of the key actors involved in cardiovascular disease prevention for women in the Netherlands, together with their main objectives and resources. Actor objectives are sourced directly from the mission statements and strategic documentation available on each organisation's official website. Fifteen actors are included.

Table 5.1: Overview of relevant actors and their objective(s) and resources

Actor	Objective(s)	Resources
European Commission	Reduce premature deaths from cardiovascular disease in EU member states by 25% by 2035 and strengthen cardiovascular health across Europe through the Safe Hearts Plan, including early detection, prevention programmes, and improved treatment access. (European Commission, n.d.)	Formal power: EU legislative and agenda-setting authority across member states Money: EU health funding programmes and grants Position in network: Formal access to all 27 EU member states, institutions, and stakeholders

		Information: EU-wide epidemiological data and comparative health policy frameworks
Ministry of Health, Welfare and Sport	Protect and improve public health in the Netherlands, reduce the burden of preventable disease, and ensure that healthcare is accessible and affordable for all residents. (Ministry of Health, Welfare and Sport, n.d.)	Formal power: National public health legislation; mandate to coordinate NPA and IZA Money: Public health budget; SPUK funding to municipalities via GALA Organisation: Ministerial coordination capacity across all prevention actors Position in network: Central coordinating position within NPA coalition
Ministry of Economic Affairs and Climate Policy	Support sustainable economic development in the Netherlands while ensuring that fiscal and market policies serve broader public interests, including public health. (Ministry of Economic Affairs and Climate Policy, n.d.)	Formal power: Fiscal policy instruments; tobacco excise tax legislation Money: Fiscal capacity; subsidy and market regulation instruments Position in network: Formal access to industry, business sector, and fiscal policy networks
National Institute for Public Health and the Environment	Safeguard and promote public health and environmental quality by providing independent scientific evidence, monitoring, and policy advice to the Dutch government. (National Institute for Public Health and the Environment, n.d.)	Knowledge: Scientific and epidemiological expertise across public health domains Information: National health monitoring systems; NPA impact assessments; surveillance data Legitimacy: Independent scientific credibility; trusted advisor status to government Organisation: National research and monitoring infrastructure
Dutch Health Institute	Ensure good, accessible and affordable healthcare for everyone in the Netherlands ("Gezond samen leven") through independent assessment of the healthcare package and evidence-based reimbursement recommendations. (National Health Care Institute, n.d.)	Formal power: Formal mandate to assess and advise on the content of the insured healthcare package (Zvw/Wlz) Knowledge: Health technology assessment and clinical effectiveness expertise Legitimacy: Independent advisory status between VWS, insurers, providers, and patients Information: Healthcare effectiveness, appropriateness, and package composition data

Health Insurers Netherlands	Arrange healthcare of good quality that is affordable and accessible for all insured, aimed at promoting their wellbeing, while balancing healthcare expenditures. (Dutch Association of Health Insurers, n.d.)	Money: Healthcare purchasing power; reimbursement decisions under the Health Insurance Act Formal power: Collective contracting authority with healthcare providers (Zvw) Organisation: Umbrella representation of 11 Dutch health insurers Position in network: Central intermediary between VWS, healthcare providers, and insured population
Dutch College of General Practitioners	Ensure that every Dutch resident has access to a trusted GP team and strengthen the position of general practitioners as the primary entry point for preventive and curative care. (Dutch College of General Practitioners, n.d.)	Knowledge: Clinical expertise in primary and preventive care; professional guidelines Legitimacy: Professional authority as representative of all Dutch GPs Manpower: Represents the full national GP workforce (~11,000 GPs) Position in network: Direct access to patients through nationwide primary care network
Association of Netherlands Municipalities	Strengthen local government in the Netherlands by collectively representing and supporting municipalities, and by placing local implementation at the centre of national societal challenges. (Association of Netherlands Municipalities, n.d.)	Position in network: Collective representation of all 342 Dutch municipalities Organisation: Local implementation capacity through municipal governments and GALA programme coordination Legitimacy: Democratic mandate through elected municipal councils Manpower: Municipal officials, local GGD staff, and GALA programme personnel
Municipal Health Services (GGD Nederland)	Protect and promote the health of all Dutch residents through collective prevention, infectious disease control, health monitoring, and local public health programmes. (GGD GHOR Nederland, n.d.)	Knowledge: Regional public health expertise in prevention and health promotion Manpower: 25 regional GGD organisations with local programme delivery capacity Information: Local and regional health monitoring and surveillance data Organisation: Operational infrastructure for executing prevention programmes at regional level
Amsterdam Vital & Healthy	Achieve equal health opportunities for all Amsterdammers by 2040, with the most vulnerable residents gaining ten additional healthy life years compared to 2020. (Vitaal & Gezond Amsterdam, n.d.)	Money: Municipal funding via GALA and IZA; access to city budget Organisation: Cross-sectoral partnerships with schools, healthcare providers, and community organisations

		Position in network: Access to Amsterdam municipal stakeholders and vulnerable populations Legitimacy: Municipal mandate with an explicit equity and inclusion focus
Dutch Heart Foundation (Hartstichting)	Reduce the burden of cardiovascular disease and improve cardiovascular health in the Netherlands for now and the future. (Hartstichting, n.d.)	Money: Independent fundraising capacity and research funding Legitimacy: Public trust and civil society authority in cardiovascular health Position in network: Broad patient and stakeholder network; co-initiator of the Cardiovascular Agenda Information: Cardiovascular research outputs and public awareness capacity
Alliantie Nederland Rookvrij	Realise a smoke-free society in the Netherlands through coalition-building, advocacy, and coordinating tobacco discouragement efforts across organisations and municipalities. (Nederland Rookvrij, n.d.)	Legitimacy: Civil society authority and public health advocacy mandate Position in network: Open coalition of Hartstichting, KWF, Longfonds, and 100+ partner organisations; smoke-free coalitions across municipalities Organisation: Coordinating capacity across sector-specific and local smoke-free initiatives Information: Evidence base on tobacco harm, cessation, and prevention effectiveness
Tobacco Industry	Maintain tobacco sales, protect commercial interests, and advocate for a regulatory environment viable for tobacco production and distribution in the Netherlands. (VSK, n.d.)	Money: Financial capacity and lobbying budget Position in network: Access to political and regulatory processes through industry associations Legitimacy: Formal right as a market participant to be heard in regulatory and legislative processes Information: Market data and consumer research used in regulatory lobbying
Food Industry	Ensure a healthy and sustainable development of the Dutch food industry while maintaining competitiveness and meeting public health, sustainability, and consumer demands. (Federatie Nederlandse Levensmiddelen Industrie, n.d.)	Money: R&D, marketing, and supply chain investment capacity Position in network: Relationships with government, science, civil society, and supply chain partners Organisation: Supply chain coordination and product reformulation capacity Legitimacy: Formal sector representation in food policy dialogue

Royal Dutch Hospitality Association	Create the ideal entrepreneurial climate for hospitality members and ensure a strong, professional, and future-proof Dutch hospitality sector. (Koninklijke Horeca Nederland, n.d.)	Position in network: Represents 17,000+ hospitality entrepreneurs through 234 local branches and regional/national structure Organisation: National and regional representation and advocacy infrastructure Money: Sector financial resources and lobbying capacity Legitimacy: Formal sector representation in policy dialogue on hospitality regulations
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5.2 Formal chart

Figure 5.1 presents the formal chart of the Dutch CVD prevention system for women. Following Enserink et al. (2022), the chart visualises the most important formal relationships between the actors involved in the prevention system. It does not aim to represent all existing relationships exhaustively but focuses on the formal relationships most relevant to CVD prevention policy.

At the European level, the European Commission provides strategic direction through the Safe Hearts Plan (2025), which establishes cardiovascular health as a Union-level priority and encourages Member States to strengthen prevention, including for women. Although healthcare policy remains a national responsibility, the Safe Hearts Plan shapes the agenda-setting context within which VWS operates.

At the national level, VWS occupies the central coordinating position. It holds the mandate for national public health policy and coordinates the National Prevention Agreement, through which it formally engages municipalities, healthcare providers, insurers, and commercial actors in shared prevention targets. VWS is advised by two knowledge institutes within its sphere: RIVM provides policy monitoring and NPA impact assessment, supplying the epidemiological evidence base through which progress toward prevention targets is tracked; ZIN provides formal agenda-setting through its Heart for Vessels report, advising on what constitutes appropriate CVD care and recommending a systemic shift from curative to preventive approaches. EZK holds a formal position at the national level through its fiscal authority over tobacco excise taxes, the single most effective tobacco control instrument currently deployed.

VWS is formally connected to ZN through the Health Insurance Act (Zvw), which establishes the legal and financial framework within which health insurers determine which preventive interventions are reimbursable. ZN's central resource in the prevention system is its reimbursement authority, through which it funds prevention programmes such as the GLI and smoking cessation support and thereby shapes the practical reach of prevention instruments.

At the local implementation level, VNG, LHV, and GGD are formally connected through coordination mechanisms. VNG represents municipalities and translates national prevention agreements into local implementation through GALA-funded municipal health programmes. GGD provides the regional public health infrastructure for executing those programmes. LHV represents general practitioners, who function as the primary care interface between national

prevention policy and individual citizens. AV&G is included as a concrete example of a municipal health organisation operating under the GALA framework, illustrating how municipal prevention programmes reach local populations.

The chart includes two categories of commercial actors. The tobacco industry is formally subject to VWS and EZK legislation and taxation, while simultaneously seeking to influence policy through lobbying directed at EZK. FNLI, KHN, and food service providers operate in the food and hospitality environment and are formally engaged through the NPA's voluntary agreements on reformulation and healthy food environments, though their commercial objectives frequently conflict with those agreements in practice.

Finally, the Dutch Heart Foundation and ANR occupy distinctive positions as civil society actors. Both contribute to agenda-setting through the Cardiovascular Agenda; ANR additionally conducts public awareness campaigns targeting the general population and coordinates the smoke-free coalition network. Neither holds formal regulatory or reimbursement authority, but both shape the normative and discursive context in which prevention policy is developed. These actor positions and their formal relationships form the basis for the multi-actor system diagram developed in Chapter 7, and provide the actor mapping against which the women-specific interventions identified in Chapter 6 are assigned.

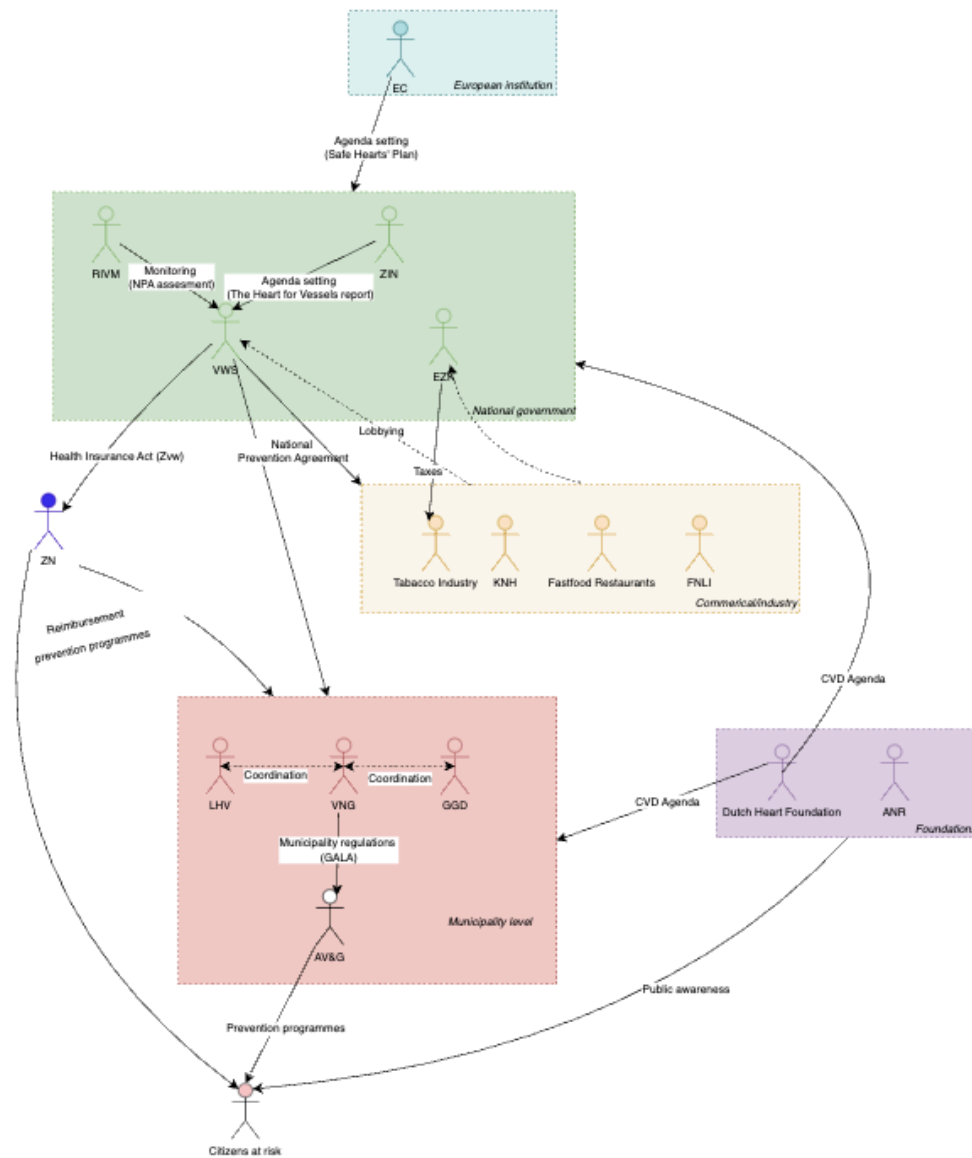


Figure 5.1: Formal chart showing the formal relationships between relevant CVD actors (own work)

6. Women-Specific Prevention Policy

This chapter addresses Sub-question 3: *Which policy interventions can be identified to strengthen CVD prevention for women within the Dutch health system?* The chapter proceeds in two steps. Section 6.1 presents the evidence base for the four interventions selected from the broader literature review. Section 6.2 describes how each intervention is linked to a specific Dutch actor mandate and existing policy instrument, explaining the rationale for each assignment. The four actor-specific linkages are formalised as a hypothetical multi-actor system diagram (diagram 1.0, Appendix A3), which served as the analytical input for the interviews in Chapter 7. The methodology underlying the literature review and intervention selection is described in Section 3.3.2.

6.1 Evidence base for the selected interventions

A systematic and targeted literature search described in Section 3.3.2 identified twelve evidence-based interventions for the primary prevention of cardiovascular disease in women. A full overview of all twelve, formulated as described in the cited literature, is provided in Appendix D. From these twelve, four were selected for elaboration in the multi-actor system diagram. The selection was guided by three criteria applied jointly: the intervention had to address a documented gap in current Dutch CVD prevention policy for women, as established in Chapter 4; it had to align with the existing mandate of a specific Dutch prevention actor, as identified in Chapter 5; and it had to connect to an existing Dutch policy instrument, providing a leverage point within the current prevention architecture rather than requiring a new institutional structure.

The first selected intervention concerns sex-specific cardiovascular risk identification in primary care. The international literature establishes that clinical inertia and inadequate GP knowledge of sex-specific risk factors are primary barriers to equitable CVD prevention for women. In the Netherlands, women aged 40 to 50 are 37% less likely than men to receive lipid-lowering treatment, and women overall are 31% less likely to have statin dosage uptitrated, despite frequently presenting with higher baseline cholesterol levels (Kiss et al., 2024; Kiss et al., 2025). These disparities are driven in part by risk assessment protocols that do not account for sex-specific risk factors, particularly adverse pregnancy outcomes, polycystic ovary syndrome, and premature menopause (Gulati, 2023). Women with a history of hypertensive disorders of pregnancy or preeclampsia face a two- to fourfold elevated risk of future CVD events, yet this risk is not systematically identified in routine primary care (Lee & Lee, 2025). The evidence points clearly toward updating clinical guidelines on sex-specific risk criteria as the most direct lever for improving risk identification.

The second intervention concerns smoking cessation among women. Women face sex-specific barriers to quitting that generic cessation programmes do not address. Evidence from a government-driven outreach programme for female smokers shows that intensive counselling in the first four weeks is the strongest predictor of sustained abstinence at six months, and that regular exercise makes long-term cessation 3.02 times more likely (Suh et al., 2023). Post-cessation weight gain and mood deterioration are the two primary cessation barriers specific to women, and neither is addressed in standard Dutch cessation provision. An outreach programme that incorporates these elements, reaching women through women-dominated workplaces and community settings, is therefore both evidence-based and absent from the current Dutch system.

The third intervention concerns obese women of childbearing age. Obesity in this group is associated with hormonal dysregulation that substantially elevates both cardiovascular and reproductive risk: obese women are three times more likely to experience infertility, and a 5% reduction in body weight can restore spontaneous ovulation (Nho, 2017). Lifestyle intervention combining physical activity, nutritional education, and psychosocial support produces measurable improvements in cardiovascular risk factors, reproductive hormone profiles, and psychological wellbeing. The evidence supports expanding eligibility for existing lifestyle programmes beyond BMI thresholds to include sex-specific reproductive health markers, reaching women whose risk is driven by hormonal and obstetric factors that current eligibility criteria do not capture (Gaffey et al., 2025).

The fourth intervention concerns physical activity infrastructure for women. Safe and accessible physical activity infrastructure is an established population-level lever for increasing physical activity, particularly in low-SES urban areas where access to safe outdoor and sport facilities is most limited (Ndejjo et al., 2021; Shahid et al., 2024). The evidence identifies the absence of sex-targeted infrastructure investment as a gap: general population approaches do not address the specific barriers women face in accessing public space for physical activity, including safety concerns and area deprivation.

6.2 Translating evidence to the Dutch context: actor assignment and policy coupling

The four interventions described above were each linked to a specific Dutch prevention actor and to an existing policy instrument, based on the mandate and resource analysis in Chapter 5 and the policy landscape described in Chapter 4. The linking process was guided by one central principle: each intervention was designed so that it can be implemented within an existing actor mandate and through an existing policy instrument, rather than requiring either a new institutional structure or a new claim of responsibility. This principle is analytically grounded in the architecture of the Dutch prevention system as described in Chapter 4, where no single actor holds overarching authority over prevention outcomes, and where the most durable policy change tends to occur through instruments that actors already operate. Chapter 7 will examine the implications of this architecture from the perspective of the actors themselves.

LHV: Updating the NHG cardiovascular risk management guideline

The NHG Standaard Cardiovasculair Risicomanagement (CVRM guideline) is the primary clinical framework governing how Dutch general practitioners assess and respond to cardiovascular risk. The guideline currently does not include sex-specific risk factors, hypertensive disorders of pregnancy, PCOS, premature menopause, as risk-enhancing criteria. Incorporating these factors creates an explicit clinical standard: GPs who encounter women with these histories become obligated, under professional quality norms, to assess and document the associated CVD risk and initiate follow-up where indicated.

LHV is assigned this means because setting and maintaining professional standards for Dutch general practitioners is the core of LHV's mandate (Chapter 5). Through the NHG guidelines, LHV already determines what GPs are expected to know and do in clinical practice. A CVRM

guideline update does not require new legislation or new funding, it requires LHV to exercise the standard-setting authority it already holds. The incentive for LHV to act is built into the institutional context. ZIN's Signalement Hart voor Vaten has already recommended a systemic shift toward earlier preventive action (Chapter 4). A formal ZIN recommendation to incorporate sex-specific risk criteria into the CVRM guideline constitutes exactly the kind of institutional signal that LHV's professional credibility depends on responding to. This sequencing creates the incentive: ZIN recommends, LHV updates the standard, GPs are obligated to apply it. LHV's goal in the system diagram is appropriate and equitable primary care for women at elevated CVD risk.

GGD and ANR: A sex-specific cessation module within the GALA framework

The GALA framework funds municipal health programmes through multi-year performance agreements between VWS and municipalities, with GGD executing programmes at the regional level. Current GALA-funded cessation provision does not include sex-specific programming: outreach is undifferentiated, and the cessation model does not incorporate the early-intensity or exercise-integration elements that the evidence identifies as particularly effective for women.

The proposed intervention is a sex-specific cessation outreach module, deployed by GGD in collaboration with ANR, targeting female smokers through women-dominated workplaces and community settings. The programme follows the evidence-based model: a minimum of four face-to-face counselling sessions concentrated in the first four weeks, combined with nicotine replacement therapy and integrated exercise counselling. The key Dutch translation is the funding mechanism: this module is included as an additional output indicator within the existing GALA framework, meaning that municipalities commit to delivering it as part of their GALA performance agreement.

GGD is assigned this means because community health promotion is GGD's statutory mandate, and GGD already delivers cessation outreach through GALA funding in established collaboration with ANR (Chapter 5). A sex-specific variant of this outreach does not require GGD to assume a new responsibility, it requires VWS and VNG to include sex-specific cessation as an explicit GALA output at the national negotiation level. This is how the incentive is created: GALA performance agreements generate both funding and accountability for municipalities to deliver agreed outputs. If sex-specific cessation is among those outputs, municipalities and GGDs have both the resource and the obligation to act. GGD's goal in the system diagram is to reduce smoking prevalence among women in the local population.

ZN and LHV: Expanding GLI eligibility within existing Zvw authority

The Combined Lifestyle Intervention is already reimbursed under Zvw and constitutes an operational prevention programme. GLI eligibility is currently defined primarily by BMI thresholds. Women whose CVD and reproductive risk is driven by hormonal and obstetric factors, PCOS, HDP history, or obesity combined with infertility, are not eligible under these

criteria, even though the evidence supports lifestyle intervention as an effective preventive measure for precisely this group (Nho, 2017; Gaffey et al., 2025; Eykelenboom et al., 2023).

The proposed intervention is an expansion of GLI eligibility to include PCOS and BMI ≥ 30 in combination with infertility or a history of hypertensive disorders of pregnancy. This does not create a new programme. It requires ZN to revise eligibility conditions for an existing Zvw-reimbursed programme, using the reimbursement authority ZN already holds (Chapter 5). LHV is co-assigned because the updated CVRM guideline creates the referral gateway: GPs who identify women under the new sex-specific criteria refer them to GLI programmes. The two interventions are therefore sequentially connected in the system diagram.

The incentive for ZN is a long-term cost argument: early lifestyle intervention for obese women of childbearing age with elevated CVD and reproductive risk reduces both future cardiovascular events and reproductive complications, costs that ZN bears through curative reimbursement. RIVM monitoring data, already used in NPA impact assessments, can make this cost trajectory visible. Where the internal cost-benefit case is insufficient, VWS holds an additional lever: linking specific subsidy allocation (SPUK) prevention funding allocation to ZN's willingness to expand GLI eligibility creates an external financial incentive for ZN to act within its existing authority. ZN's goal in the system diagram is to reduce long-term preventable healthcare costs through structured prevention for identifiable high-risk groups.

VNG: Sex-targeted infrastructure allocation within GALA

GALA already funds physical activity infrastructure at the municipal level, and sub-system 0.1 established that VNG already operates this investment mechanism within the current prevention system. The proposed intervention is a sex-targeted intensification: GALA multi-year agreements between VWS and VNG are revised to include an explicit output indicator for accessible physical activity infrastructure in areas with high concentrations of women at CVD risk, particularly low-SES urban neighbourhoods where infrastructure gaps are largest.

VNG is assigned this means because local implementation of prevention through GALA-funded programmes is explicitly within VNG's mandate, and VNG collectively represents the 342 Dutch municipalities through which this investment is delivered (Chapter 5). A sex-targeted infrastructure output does not require VNG to assume a new responsibility, it requires VWS to include this specificity in GALA negotiations, which VWS already leads. GALA performance agreements again generate the incentive: if sex-targeted infrastructure is an agreed output, municipalities have both the resource and the obligation to act.

These four actor-specific policy linkages were formalized as a hypothetical multi-actor system diagram (diagram 1.0, Appendix A3), following Enserink et al. (2022). The diagram maps the proposed actor means, their assumed causal pathways, and the system tensions that emerge when the four interventions are modelled together, including the conflict actor dynamics produced by the tobacco industry's position within the cessation sub-system. It does not represent existing policy but serves as an analytically structured hypothesis: a concrete system

model that anchored the semi-structured interviews in Chapter 7 and allowed actors to validate, extend, or challenge the assumed causal relations from their own institutional experience.

7. Actor Perspectives on the Dutch CVD Prevention System

This chapter addresses sub-questions 4 and 5: *how do actors perceive the system of CVD prevention for women?* and *How do actor perspectives update and validate the understanding of that system?* To address these questions, seven semi-structured interviews were conducted with actors from the Dutch CVD prevention system, as identified in Chapter 5.

Three preliminary diagram versions provided the analytical structure for this chapter. Sub-system diagrams 0.1 and 0.2, constructed in Chapter 4 and provided in Appendix A1 and A2, map the current Dutch CVD prevention system for overweight and smoking respectively. Diagram 1.0, constructed in Chapter 6 and provided in Appendix A3 maps a hypothetical women-specific extension of that system. These diagrams were not shared with participants prior to or during the interviews to avoid anchoring their responses, but they structured the interview topics and provided the analytical baseline against which the findings in Section 7.2 are evaluated. Anonymised summaries of all interviews are provided in Appendix F.

Section 7.1 provides a sector overview of the sample and maps the thematic distribution of coded fragments across sectors. Section 7.2 presents the thematic analysis of actor perspectives. Section 7.3 describes how the interview findings update and validate the three preliminary diagram versions, resulting in three empirically refined final diagrams.

7.1 Sector overview and thematic distribution

Interviewees are grouped into four sectors based on their professional background and institutional role: S1 (Policy and Health System), S2 (Built Environment), S3 (Public Health and Prevention), and S4 (Commercial). Table 7.1 presents the sector assignment of all participants. Note that not every sector contains the same amount of interviewees, this might lead to a biased representation within the further analysis in this chapter. The absolute number of coded fragments per sector is therefore partly a function of sample size rather than analytical salience alone. A full overview of all codes and their theme assignments is provided in Appendix G.

Table 7.1: Sector assignment of interview participants

Sector	Interviewee	Professional background
S1: Policy & Health System	I1	Multidisciplinary background spanning the pharmaceutical industry, healthcare policy, digital health, and patient advocacy
S2: Built Environment	I2	Architect and urban planner; interdisciplinary research on healthy place-making and social-spatial transformation in urban areas
S3: Public Health & Prevention	I3, I5, I7	Public health professional with a background in medicine; working on health system strengthening, health equity, and multi-stakeholder collaboration for NCD prevention

S4: Commercial	I4, I6	Representative of a tobacco manufacturers' trade association
S3: Public Health & Prevention	I5	Programme director of a large municipal health and prevention network, working to reduce health inequalities in a major Dutch city
S4: Commercial	I6	Health-oriented food and drink entrepreneur
S3: Public Health & Prevention	I7	Youth health organisation focused on healthy weight and lifestyle

Thematic distribution across sectors

Figure 7.1 presents a Sankey diagram mapping the distribution of 170 coded fragments across the four sectors and six themes. A Sankey diagram is a flow visualisation in which each band connects a source (left: interview sector) to a destination (right: thematic category). The width of each band is proportional to the number of coded fragments flowing from that sector to that theme: a wide band indicates that many fragments from a given sector were assigned to that theme, while a narrow band indicates fewer. Reading the diagram from left to right, the total outflow from each sector reflects how many coded fragments it contributed across all themes; reading from right to left, the composition of each theme shows which sectors contributed most to it.

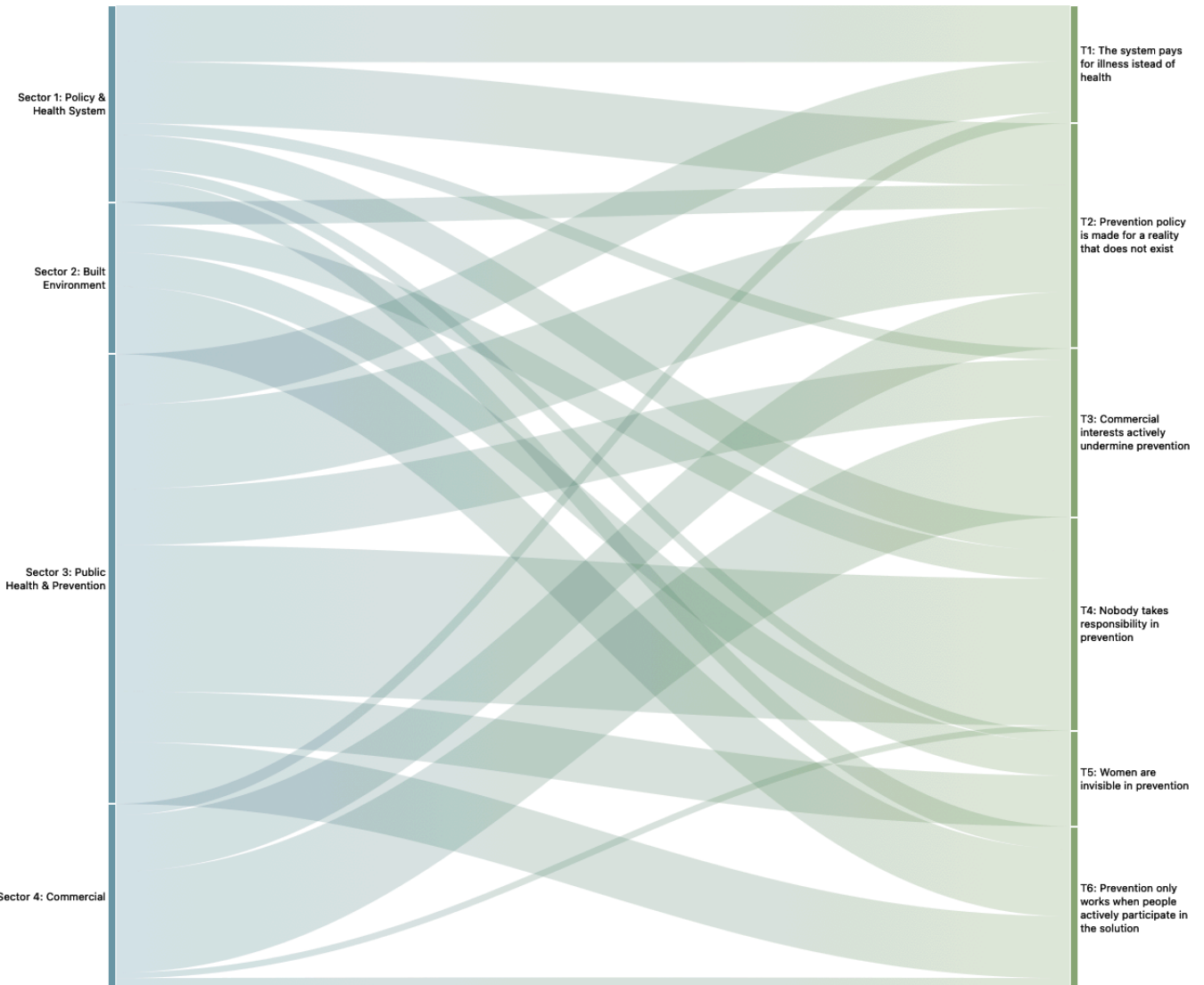


Figure 7.1: Sankey diagram resulting from thematic analysis

Several patterns in Figure 7.1 are analytically relevant. S1 (Policy and Health System) is concentrated in T1 (Economic logic) and T2 (Policy from a filtered reality), consistent with the systemic and institutional framing that characterises a policy-oriented interviewee. S3 (Public Health and Prevention) is the primary contributor across most themes and dominates T4 (Fragmented responsibility) and T6 (Ownership and co-creation), consistent with the prevention sector's structural preoccupation with coordination failures and co-design as preconditions for impact. S4 (Commercial) is heavily weighted toward T3 (Conflicting system logics), with almost no contribution to T5 (Women's health), indicating that commercial actors engage primarily with the legitimacy and effectiveness of regulation rather than with sex-specific health outcomes. T5 draws almost exclusively from S2 and S3: the spatial and public health perspectives are the primary carriers of women-specific content, while the commercial and policy sector voices are largely absent from this domain.

Two themes show particularly pronounced framing divergences across sectors: T1, where Sectors 1 and 3 agree on the structural barrier but differ on whether economic logic can conditionally enable prevention; and T3, where the two commercial interviewees hold structurally opposed understandings of the commercial sector's role, with I4 framing commercial exclusion from policy as a regulatory design problem and I6 confirming from the inside that market logic structurally prevents health-promoting choices regardless of regulatory intent. These framing divergences are documented in full in Appendix E, including the specific Atlas.ti codes underlying each framing position.

7.2 Overlapping interview themes

A thematic analysis was conducted across seven semi-structured interviews with actors from the Dutch CVD prevention landscape. Following the six-phase framework of Braun and Clarke (2006), a hybrid deductive-inductive coding strategy was applied: initial codes were derived inductively from the interview data, while the multi-actor system diagram provided a structural lens for interpretation and organisation. A total of 170 coded fragments were generated across all interviews in Atlas.ti (qualitative data analysis software) and subsequently grouped into six overarching themes. Together, these themes illuminate structural, economic, institutional, and social dynamics that shape, and frequently constrain, effective CVD prevention in the Netherlands, with particular attention to the position of women. Each theme is presented below, illustrated with representative quotes from the interviews, referenced as I1 through I7.

T1: The system pays for illness instead of health

The first theme captures how financial incentives shape the scope and direction of CVD prevention in the Netherlands. Across interviews, actors consistently described a health system in which the economic returns on prevention are either absent, delayed, or misattributed, making sustained investment in preventive interventions structurally unattractive for most formal actors. The reimbursement architecture, anchored in the Zorgverzekeringswet (Zvw), is built around care production rather than health maintenance, creating a structural bias toward curative rather than preventive action. As one interviewee summarised, the system effectively profits from illness: treating disease is billable, preventing it is not. At the same time, prevention does occur when it aligns with other economic interests, notably where employers seek to reduce workforce absenteeism, or where entrepreneurs develop healthier products for a market increasingly oriented toward lower-additive options. Economic logic does not uniformly obstruct prevention; it selectively enables it when a financial case can be made.

"The current system profits from illness, we have 'illness profit' (ziektewinst). And we actually want 'health profit'. That doesn't exist yet. There is an enormous conflict there." - I1

These observations converge on a fundamental structural tension: all actors acknowledge the value of prevention, yet the financial architecture of the system penalises those who invest in it. One interviewee described how a hospital that concentrated on health and prevention ultimately ended up with fewer patients and therefore less insurance income, illustrating that prevention efforts at the provider level are self-undermining within the current reimbursement model. Within the multi-actor system diagram framework, this theme exposes a misalignment between the means available to prevention actors and the incentive structures that determine whether those means are deployed.

T2: Prevention policy is made for a reality that does not exist

A pervasive finding across interviews was that prevention policy is formulated within a limited, expert-filtered perspective that does not adequately reflect the lived reality of the populations it aims to reach. This theme encompasses the dominance of expert-based and aggregated data over experiential knowledge in policy design, the tendency to translate political agreement into text rather than action, the absence of feedback loops between policy intentions and real-world outcomes, and a recurring pattern of implementing measures whose effectiveness has not been empirically demonstrated.

"I asked 'At what level do you want to achieve impact?' They [medical experts] said 'at the level of the patient.' I said: 'but there you need experience-based data, and the reports you use are expert-based. That is something completely different.'" - I1

"If the government or GGD just points a finger and says 'you must move more,' it isn't effective. You must align with the individual's needs and intrinsic motivation." - I5

What connects these observations is not individual incompetence but a structural disconnect between the environments in which policy is made and those in which it must operate. Prevention policy frequently targets behaviour change in populations whose daily constraints, financial, social, spatial, and cognitive, are not incorporated into the design. The quality of prevention policy is constrained not primarily by a lack of political will, but by a structural failure to integrate experiential knowledge into the design process.

T3: Commercial interests actively undermine prevention

The third theme addresses structural conflicts between the health system and other dominant system logics, particularly commercial, digital, and market logics, that operate on fundamentally different and often incompatible incentive structures. A key insight across interviews was that prevention interventions do not occur in isolation: when a health measure is introduced, other systems adapt in response, often in ways that neutralise the intended effect. Evaluating prevention policies solely on their intended mechanisms, without accounting for the countervailing responses they are likely to trigger, will systematically overestimate their effectiveness.

"The moment you try to do some intervention somewhere, like making an awareness campaign or telling people to eat certain healthy food, other systems adapt to that and prevent you from reaching your goal." - I3

"For cafes, the number one priority is how much time it takes for the staff to prepare it. Second is how much margin they have, and then whether it's healthy and tasty." - I6

The tobacco excise tax is particularly instructive: an instrument widely regarded as effective for tobacco control instead displaced consumption to cheaper foreign and informal markets, reducing domestic tax revenue without a commensurate reduction in smoking prevalence. The account from I6 illustrates the same dynamic at the micro level: even when a genuinely healthier product exists, commercial intermediaries prioritise operational cost and margin over health properties. This theme produced the most pronounced framing contradiction in the dataset: the

two commercial interviewees held structurally opposed positions on the commercial sector's role in prevention, a divergence documented in detail in Appendix E.

T4: Nobody takes responsibility in prevention

Across interviews, actors described a prevention system in which responsibility for health outcomes is diffuse, structurally unclear, and ultimately owned by no single actor. This fragmentation operates simultaneously at multiple levels: between healthcare domains, between administrative tiers, between organisations working on adjacent problems, and within organisations themselves. A pattern that recurred across interviews was that individual actors understand the need for collaboration, actively desire it, and yet are structurally prevented from realising it, by narrowly defined mandates, vertically organised funding streams, and a system that rewards individual domain performance rather than collective health outcomes.

"VWS is not one organization; it consists of thousands of little kingdoms going their own way." - I1

"Nobody in the chain feels responsible for the end result of the whole chain." - I1

"In order for collaboration to happen, everybody is waiting for everyone else, or waiting for someone in between to do that." - I3

These observations show that fragmented responsibility is not a feature of individual actors' unwillingness to collaborate but of the architecture of the system itself. The proliferation of coordination structures further illustrates the paradox: the system's response to a lack of collaboration is to add new structures, which themselves become additional nodes requiring coordination. Within the multi-actor system diagram framework, this theme points to a systemic absence of shared ownership over the CVD prevention outcome, in which all actors can simultaneously claim commitment to prevention and bear no responsibility for its failure.

T5: Women are invisible in prevention

This theme captures the ways in which women are rendered structurally invisible across multiple domains that shape cardiovascular health: medical research, clinical practice, spatial planning, and policy design. The dominant frame in each domain is implicitly male, meaning that interventions designed for the average patient or citizen systematically fail to reach or serve women, particularly those from low-SES or migrant backgrounds.

"Almost all research is conducted on men and not on women. We primarily do research on men and simply apply it to women. So you have an enormous bias that many people are unaware of." - I1

"Medical research hasn't historically focused on women, which is only slowly being recognized. For highly educated women, it's already hard to get good care because less is known about the female body. That difficulty doubles if you have less education, less cultural capital, or can't communicate as well with providers." - I5

"Women from migrant communities might have certain barriers in terms of how they access more healthy life choices, not just exercise, but other things." - I2

The spatial dimension of this theme, articulated most directly by I2, adds a perspective rarely visible in CVD prevention literature: the safety of public space as a structural prerequisite for physical activity. Women's reduced access to public outdoor space is not a matter of individual preference but a structural constraint with direct implications for cardiovascular risk. This theme points to an invisibility of women that operates simultaneously and independently in scientific, clinical, and spatial domains, compounding the disadvantage for women who face multiple intersecting barriers.

T6: Prevention only works when people actively participate in the solution

The sixth theme reflects a cross-cutting insight that emerged consistently across interviews: durable prevention requires genuine ownership by the people it is meant to serve. This stands in direct contrast to the top-down, expert-designed forms of citizen engagement that currently dominate Dutch prevention policy. Actors described how superficial engagement with citizens produces not only ineffective interventions but active disengagement, eroded trust, and what one interviewee termed engagement fatigue, a diminished willingness to participate in future initiatives. Conversely, examples of authentic co-design and bottom-up community initiative were consistently described as more effective, more sustainable, and more capable of reaching populations that formal health services routinely miss.

"There's no feedback loop and people get really annoyed and have 'engagement fatigue'." - I2

"What you want is that it doesn't just remain a collection of separate initiatives, all separate small things, but that it really continues to build toward a kind of transition. Truly toward a healthy society." - I7

"Behavior changes when the way you look at the world changes." - I1

These findings suggest that the current model of prevention, in which experts design interventions for citizens who are informed but not involved, is not merely suboptimal but actively counterproductive in communities where institutional trust is already low. The role of the formal system is not to design change but to create conditions in which bottom-up change can be supported, absorbed, and eventually scaled.

7.3 Updating and Validating the Multi-Actor System Diagrams

The interview data served three analytical functions in relation to diagrams 0.1, 0.2, and 1.0, as illustrated in Figure 7.2. First, the six themes provided interpretive depth on why and how the causal mechanisms in the preliminary diagrams operate as they do. Second, several assumed (red) causal relations were confirmed through practitioner experience and converted to green arrows. Third, interviewees identified factors, relations, and actor means that were absent from

the preliminary versions, incorporated as new green elements. Each sub-system was updated through this process, producing three empirically refined final diagrams: 2.1 (overweight), 2.2 (smoking), and 2.0 (women-specific). The colour-coding convention used throughout is as follows: black arrows represent relations formally established in policy documents; blue arrows reflect literature-supported causal mechanisms; red arrows indicate assumed connections; green solid arrows represent new interview-derived elements; and green dotted or striped arrows represent assumed relations validated as confirmed but underperforming pathways. Striped arrows of any colour indicate intended but dampened causal effects and dotted arrows indicate a time delayed effect.

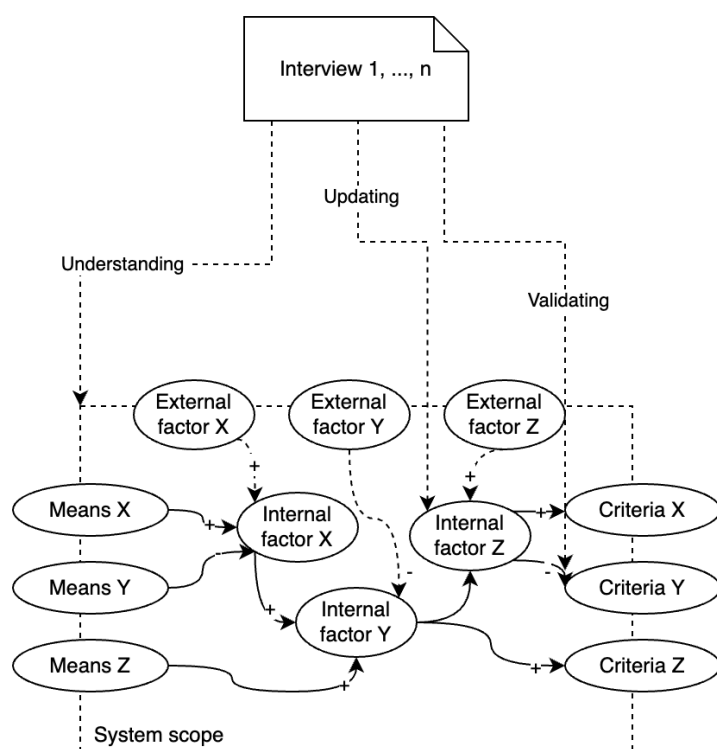


Figure 7.2: Conceptualization of interview insights (own work)

7.3.1 Thematic Implications for System Interpretation

Before presenting the diagram-level updates, this section traces how the six themes collectively reframe how the diagrams should be read. The themes do not only describe actor perspectives; they show structural features of the prevention system that are not visible in the policy and academic literature on which the preliminary diagrams were built.

T1 shows that the institutional architecture of the Zvw structurally rewards treatment over prevention. Actor means embedded in this system, particularly ZN's reimbursement instrument,

compete with a financial logic that systematically disadvantages all corrective pathways, making the arrow from means to outcome less direct than the diagram implies.

T2 shows that the single SES external factor understates the compound nature of access barriers: financial insecurity, chronic illness, time poverty, and postcode interact in ways that no single reimbursement instrument resolves. Beyond that, formally established means systematically underperform when programme design is not built around citizens' actual constraints, meaning that the means-to-programme-uptake arrows are conditional on accessibility and design conditions the diagrams do not make explicit.

T4 shows that in practice actors withhold their means pending initiation by another: the multi-actor design of prevention programmes depends on coordination that each actor assumes someone else will initiate, meaning those arrows are conditional on a coordination trigger that may not materialise.

T5 adds a knowledge production dimension to diagram 2.0 specifically. The GP knowledge gap is not only an educational problem addressable through LHV training; it is rooted in the male-biased cardiovascular evidence base, which defines a structural ceiling on what any training intervention can achieve independently of training quality.

T3 shows a persistent gap between commercial actors' stated positions and their structural system effects: the conflict actor arrows in the diagrams represent this structural role, which persists regardless of rhetorical cooperation signals from those actors.

7.3.2 Sub-system 2.1: Overweight and obesity

Figure 7.3 presents diagram 2.1, the interview-updated overweight sub-system. A full specification of all causal relations is provided in Appendix B4.

The diagram maps five actors. VWS sets national overweight reduction targets and deploys the Nutri-Score labelling instrument, connected to reduced consumption of unhealthy food as a dotted black arrow: RIVM evaluation confirms a negligible effect on BMI (Eykelboom et al., 2023). ZN reimburses the Combined Lifestyle Intervention (GLI) through the Zvw, shown as a dotted black arrow, reflecting formal coverage since 2019 with limited population-level impact due to low participation rates and the GP referral requirement that constrains reach (Eykelboom et al., 2023). VNG deploys two GALA-funded instruments: healthy food environment improvements, shown as a solid black arrow to healthy food availability, and sport and exercise provision, shown as a solid black arrow to physical activity level. The food and beverage industry and KHN operate as conflict actors, deploying marketing, product design, and lobbying to sustain unhealthy food consumption, with sales revenue as their primary goal.

Three external factors shape the system from outside its boundary. Socioeconomic conditions in the population drive demand for cheap, calorie-dense food, providing the entry point for the R3 feedback loop. The structural power imbalance between internationally branded unhealthy retailers and local healthy food outlets increases fast food restaurant density and reduces

healthy food availability. Social media is added as a third external factor, amplifying the R1 normalisation loop through continuous promotion of sedentary and convenience-oriented lifestyles in ways that operate outside the reach of any actor in the diagram.

Three reinforcing feedback loops are present. R1 (obesogenic food system) connects consumption of unhealthy food and normalisation of unhealthy dietary patterns in a bidirectional loop: normalised patterns sustain demand, which sustains commercial supply and marketing, which sustains normalisation (Ter Ellen et al., 2025). R2 (price-accessibility loop) runs through fast food restaurant density: higher density reduces the price of unhealthy food, increasing consumption, which drives market expansion and further outlet density (Waterlander et al., 2025). R3 (socioeconomic stress loop) enters through SES as an external factor: financial constraint drives demand for cheap, calorie-dense food, sustaining the health burden and the socioeconomic conditions that triggered the loop. For individuals in R3, individual lifestyle advice, the dominant instrument in current Dutch prevention policy, does not address the underlying economic driver.

Four new elements are introduced from the interviews. Point-of-sale decision complexity is introduced as a new internal factor, receiving an incoming relation from KHN's lobbying means: by limiting reformulation requirements and sustaining dense, energy-dense product environments at the point of purchase, the commercial food sector structurally increases the cognitive difficulty of healthy choice within the approximately three-second consumer shelf-decision window. Social norms around physical activity are added as a new internal factor linking GLI participation rate to physical activity level through peer normalisation effects that operate independently of formal programme enrolment. Actor coordination failure is added as a new external factor with a negative relation to GLI participation rate, capturing the T4 finding that the multi-actor design of the GLI depends on coordination between health insurers, municipalities, and GPs that no single actor consistently initiates. Four assumed relations are validated: SES to chronic stress, KHN lobbying to consumption of unhealthy food, physical activity level to VNG's goal, and consumption of unhealthy food to KHN sales revenue.

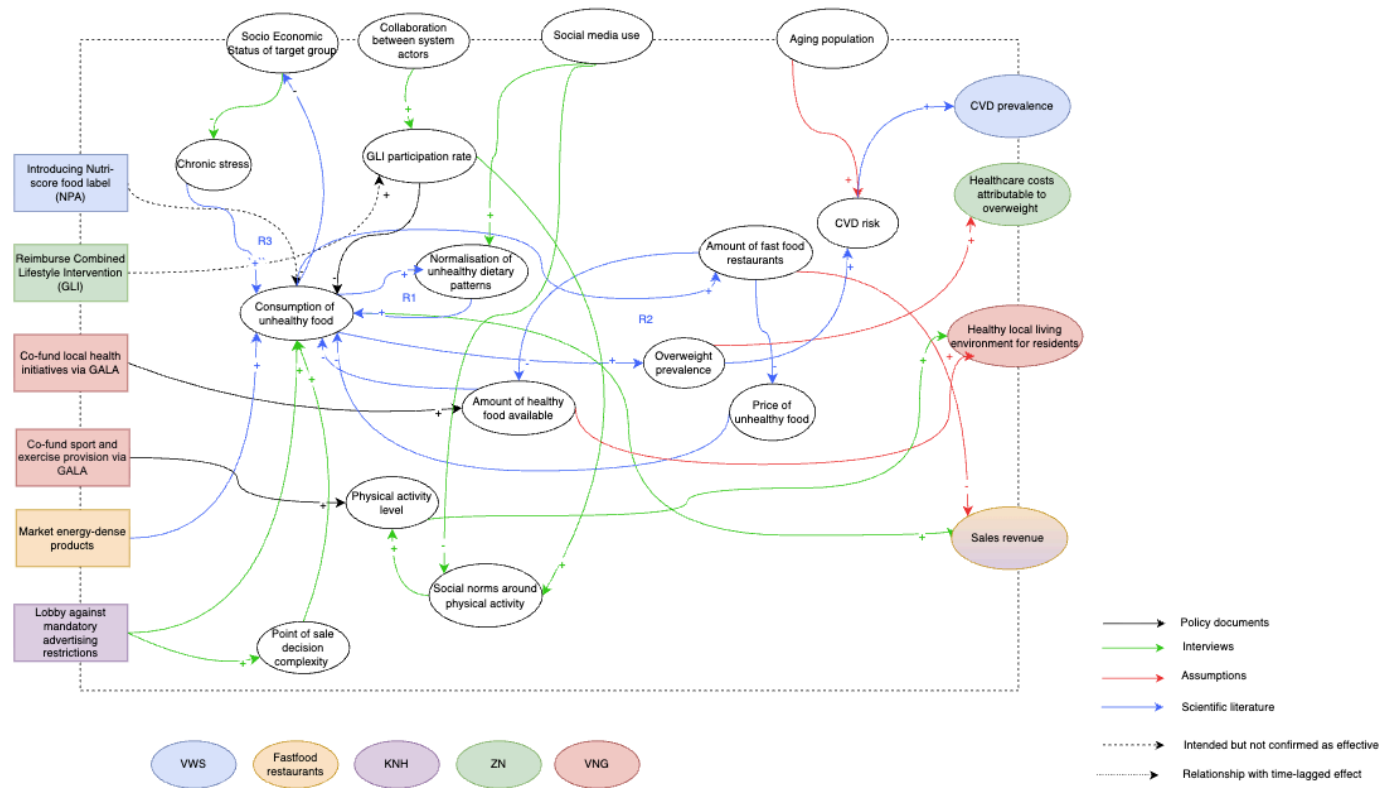


Figure 7.3: multi-actor sub-system diagram 2.1 (own work)

7.3.3 Sub-system 2.2: Smoking

Figure 7.4 presents diagram 2.2, the interview-updated smoking sub-system. A full specification of all causal relations is provided in Appendix B5.

The diagram maps six actors. EZK deploys tobacco excise tax increases as the single most effective NPA instrument (Kuijpers et al., 2023), shown as a solid black arrow to the price of tobacco products: the 2024 increase of 30.7% was associated with a 6.1% reduction in adult smoking prevalence and a 9.2% reduction among youth. VWS contributes mandatory smoke-free environments and progressive restrictions on tobacco sales points, both connected to the social norm around smoking as a pathway toward denormalisation. ZN finances smoking cessation support free of the mandatory deductible; this corrective pathway is shown as a dotted arrow, as only 7.4% to 9.3% of smokers attempted to quit using formal care (Kuijpers et al., 2023). VNG supports the Rookvrije Generatie approach across municipalities. ANR coordinates public awareness campaigns across its coalition to reinforce denormalisation. The tobacco industry operates as a conflict actor, deploying marketing in socially vulnerable communities and lobbying against mandatory restrictions, with its means shown as counteracting the denormalisation efforts of all other actors.

Three external factors shape the system. Socioeconomic conditions in the population drive financial strain, which increases chronic stress and smoking as a coping mechanism, providing the entry point for the R2 feedback loop. Autonomous behavioural trends are added as a new external factor with a negative relation to smoking prevalence: I4 raises the empirical question of whether observed prevalence declines should be attributed to NPA policy instruments or to generational and social change that would have occurred independently, complicating causal attribution across the diagram's corrective pathways.

Two feedback loops are present. R1 (social normalisation loop) connects smoking prevalence and the social norm around smoking: high prevalence reinforces social acceptability, lowering the threshold for initiation and sustaining prevalence. R2 (financial stress trap) describes a reinforcing cycle specific to low-income smokers: financial strain drives stress, stress drives smoking as a coping mechanism, tobacco expenditure worsens financial strain, which maintains the stress that drives smoking. For this group, price-based instruments, the dominant tobacco control lever, intensify R2 rather than interrupting it.

Four new elements are introduced from the interviews. Autonomous behavioural trends are added as described above. Product substitution is introduced as a new internal factor: rather than quitting, a proportion of smokers redirect toward alternative nicotine products or cross-border purchases when prices increase, partially undermining the intended corrective effect of price policy. VWS's active exclusion of the tobacco industry from the regulatory design process is introduced as a new actor means: I4 confirms this exclusion and argues that it produces an unintended negative effect on tobacco control measure effectiveness, as measures are designed without access to product knowledge and market behaviour data that VWS does not otherwise hold. This assumed negative relation is carried forward as a red arrow toward tobacco control measure effectiveness. Three assumed relations are validated: the social norm pathway to the Smoke Free Netherlands goal is validated as a dotted arrow, reflecting policy intent without reliable practical effect, as interviewees confirmed that prescriptive denormalisation approaches trigger defensiveness rather than behaviour change; the relation between declining social norms and VNG's goal is validated from municipal practice; and the relation between smoking prevalence and tobacco industry sales revenue is validated through I4's self-disclosed strategic interest.

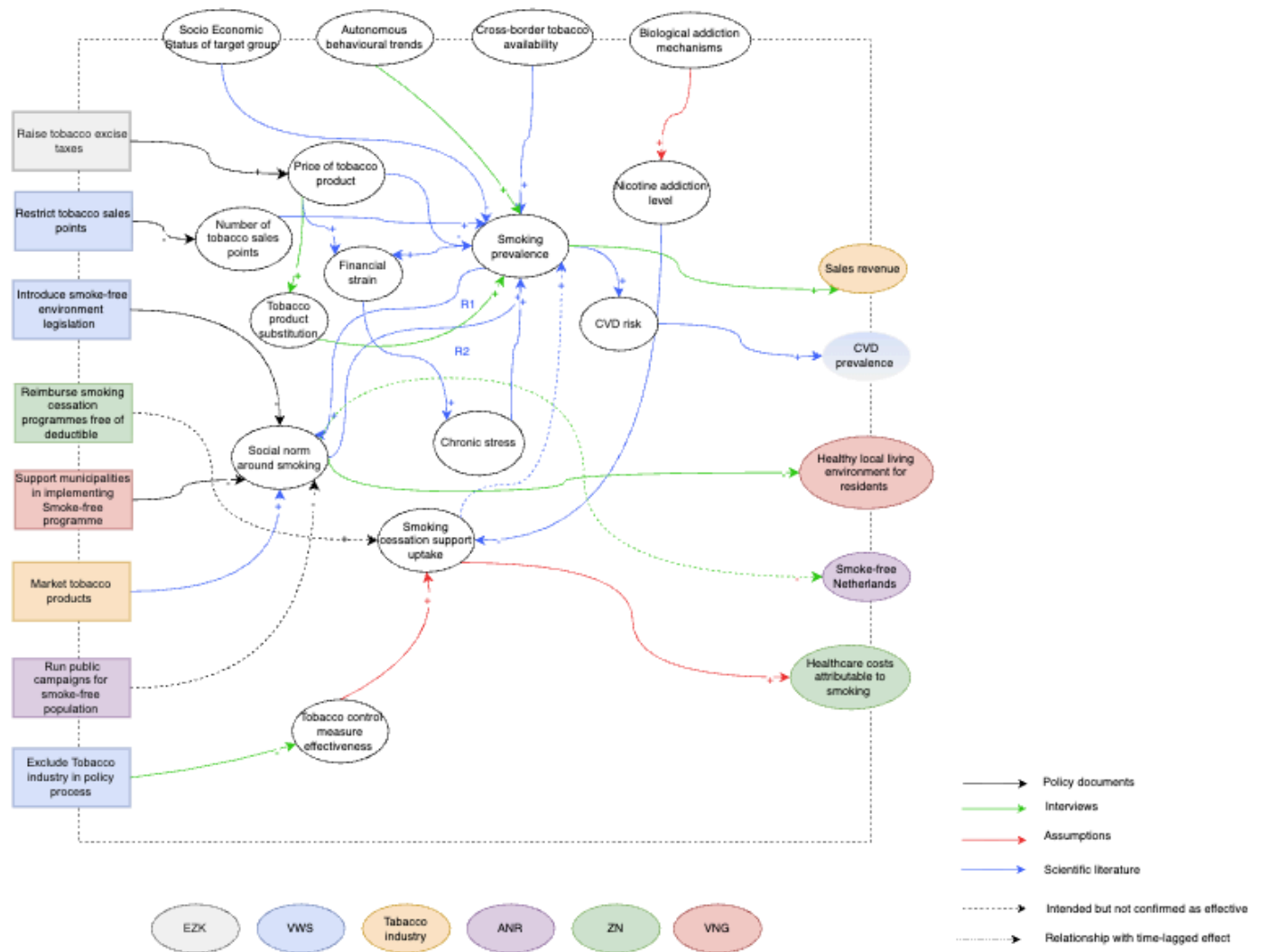


Figure 7.4: multi-actor sub-system diagram 2.2 (own work)

7.3.4 Sub-system 2.0: Women specific

Figure 7.5 presents diagram 2.0, the interview-updated women-specific sub-system. A full specification of all causal relations is provided in Appendix B6.

The diagram maps four cooperative actors with their proposed means and one conflict actor. LHV is assigned structured GP training on sex-specific CVD risk factors, shown as a black arrow to GP knowledge of sex-specific CVD risk: the NHG CVM guideline update creates a professional obligation for GPs to assess adverse pregnancy outcomes, PCOS, and premature menopause as risk-enhancing factors, converting LHV's existing guideline-setting mandate into a specific causal input. GGD deploys a sex-specific smoking cessation outreach programme in

collaboration with ANR, targeting female smokers through women-dominated workplaces and community settings with intensive counselling and integrated exercise support. ZN establishes a Zvw-reimbursed lifestyle programme for women with sex-specific CVD risk profiles, extending the eligibility criteria of the existing GLI to include PCOS, HDP history, and BMI above 30 in combination with reproductive risk markers. VNG invests in safe physical activity infrastructure, shown as a black arrow to availability of local exercise facilities, creating the structural precondition for increased physical activity levels. The tobacco industry remains the single conflict actor, deploying lobbying against cessation reimbursement expansion as a means that directly counteracts GGD's programme.

Two external factors shape the system at the population level. Socioeconomic conditions in the population operate through three pathways: they independently elevate CVD risk through financial barriers to healthy food and reduced physical activity; they drive chronic psychosocial stress through financial strain and caregiving burden; and they limit uptake of the lifestyle programme despite Zvw reimbursement, through time constraints and lower health literacy. Hormonal and reproductive biology constitutes a second external factor, encompassing oestrogen decline at menopause, PCOS-related hormonal dysregulation, and vascular damage from hypertensive disorders of pregnancy. This factor independently elevates CVD risk beyond what traditional risk models capture and generates the scientific evidence base from which GP training and clinical guideline updates draw.

Two feedback loops structure the system dynamics. R1 (chronic stress and cessation failure) describes a reinforcing vicious cycle: chronic psychosocial stress suppresses cessation success among women by triggering relapse and reducing the effectiveness of cessation interventions, while sustained smoking maintains chronic stress through the nicotine withdrawal-relief cycle. The GGD cessation programme is the primary counter-force to R1; the tobacco industry's lobbying reinforces R1 by maintaining the policy conditions under which the programme must operate with limited reach. B1 (municipal budget constraint) describes a balancing pathway: VNG's infrastructure investment creates exercise facilities and increases physical activity levels, but simultaneously depletes the municipal health budget, creating a structural ceiling on sustained investment unless GALA funding is renewed.

Three new elements are introduced from the interviews. Medical research gender bias is added as a new external factor with a negative relation to GP knowledge of sex-specific CVD risk: the cardiovascular evidence base is structurally male-biased, establishing a ceiling on what LHV training can achieve independently of training quality, as no training programme can transfer knowledge that the scientific literature has not yet produced at the required sex-disaggregated level. Perceived safety in public outdoor space is added as a second new external factor, connecting through women's outdoor physical activity as a new internal factor to overall physical activity levels: this structural barrier operates independently of VNG's infrastructure investment and determines whether women can translate available exercise infrastructure into actual physical activity. Six assumed relations are validated: VNG investment translates into actual equipment availability, but the onward relation to physical activity is validated as a dotted arrow, confirming that provision does not automatically produce use when safety and design conditions

are not met; the tobacco industry's lobbying against cessation reimbursement expansion is validated as a dotted arrow, as formal exclusion from the policy process dampens the assumed direct causal effect; LHV training is confirmed to increase GP workload, validating B1 as a capacity constraint rather than a knowledge gap; SES is confirmed as a multidimensional barrier to programme uptake extending beyond financial cost; and the B2 municipal budget pathway is validated but shown to be constrained by GALA funds being absorbed at provincial rather than local level.

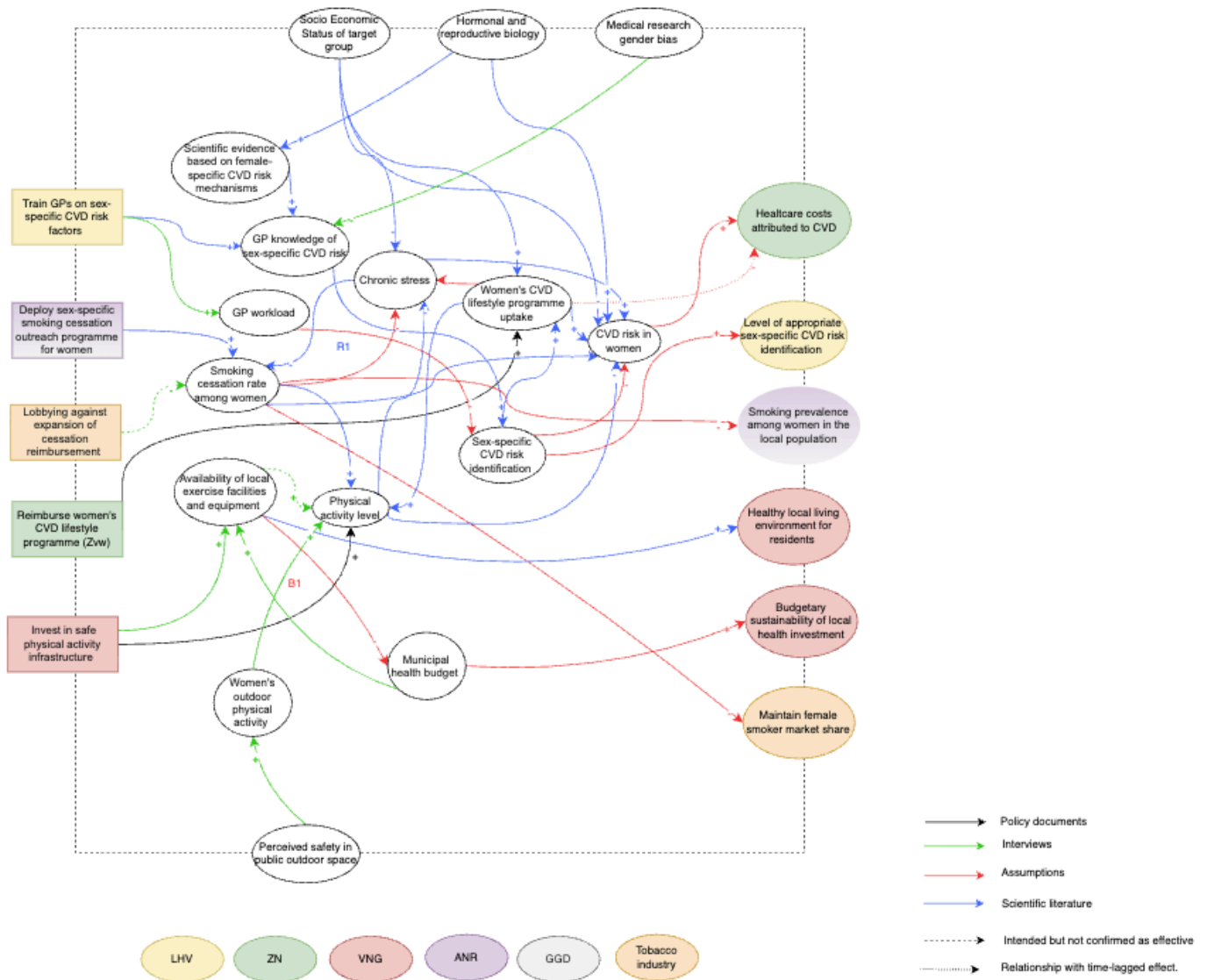


Figure 7.5: multi-actor system diagram 2.0 (own work)

8. Discussion

8.1 Method reflection

The multi-actor system diagram, developed following the framework of Enserink et al. (2022), proved well-suited as the central analytical tool for structuring the Dutch CVD prevention problem and tracing the relationships between actors, means, system factors, and outcomes. Its iterative application across successive diagram versions produced progressively more reliable representations of the prevention system. At the same time, each version revealed new methodological limitations that shaped the research design and are worth reflecting on systematically. A more detailed reflection on each individual diagram version is provided in Appendix H (sections H1 through H4); this section draws on those reflections to present an integrated methodological assessment, organised by phase.

8.1.1 Version 0.0: establishing a national baseline

The decision to begin with a high-level diagram (version 0.0) reflecting the national CVD prevention system as a whole was methodologically motivated by the need to establish a baseline overview before narrowing the analytical scope. However, as Appendix H1 discusses, this level of aggregation also produced a fundamental limitation: version 0.0 primarily reflects the intended functioning of policy as described in formal agreements and strategic documents, rather than the actual effects of that policy in practice. At the aggregated level, it is not possible to distinguish between relationships that are supported by empirical evidence and those that represent intended or assumed effects embedded in policy design. The diagram also proved too coarse to identify the feedback mechanisms, specifically reinforcing loops and self-sustaining dynamics, that explain why prevention targets are consistently missed. These limitations motivated the narrowing of the analytical scope to overweight and smoking as the two dominant CVD risk factors and the construction of dedicated sub-system diagrams at a finer level of granularity.

8.1.2 Sub-system diagrams 0.1 and 0.2: zooming in on specific parts of the system

The sub-system diagrams (versions 0.1 and 0.2) addressed several of the limitations identified in version 0.0 by making actor-specific instruments, evidential distinctions through the arrow colour convention, and reinforcing feedback loops explicitly visible. As Appendix H2 notes, splitting the system into sub-systems proved valuable for gaining a more detailed understanding of the underlying causal interactions. The use of different arrow colours and line types contributed to the transparency of the modelling process, making it possible to assess the evidential basis of each causal relation. However, important limitations remained even at this level of granularity. The sub-system diagrams were constructed primarily on the basis of policy documents and scientific literature, which meant that they continued to reflect largely intended policy structures rather than the system as it functions in practice. Policy documents describe intended responsibilities and expected outcomes, but offer limited insight into the practical challenges, informal dynamics, and implementation barriers that determine whether those

intended structures actually produce their assumed effects. This limitation is expressed in the high proportion of dotted and assumed arrows that remained in diagrams 0.1 and 0.2 even after evidential differentiation was applied. The sub-system diagrams should therefore be regarded as initial representations of the system rather than complete depictions of reality, requiring stakeholder perspectives to validate, refine, and challenge the assumptions embedded in them.

8.1.3 Version 1.0: integrating women-specific interventions

System diagram 1.0 extended the analytical scope from the current situation to a hypothetical future situation, mapping evidence-based women-specific interventions onto the actor landscape constructed in Chapter 5. As Appendix H3 describes, this diagram demonstrates that the multi-actor system diagram is a useful tool for integrating policy interventions identified in the scientific literature into a broader systems perspective, and for explicitly linking interventions to the actors most likely to implement them. By doing so, diagram 1.0 makes visible the absence of any existing policy instrument directly targeting female-specific CVD risk factors, a gap that a list of interventions without an actor and system context would not expose. At the same time, the hypothetical nature of diagram 1.0 introduced a methodological challenge qualitatively different from those of the current-state diagrams. Because the proposed interventions had not yet been implemented in the Dutch context, the causal relations in diagram 1.0 rested entirely on evidence drawn from the scientific literature and on researcher interpretation. It was not possible to distinguish between relationships that are effective in principle and those that would prove ineffective or only partially effective in the specific institutional conditions of the Dutch prevention system. As Appendix H3 concludes, this limitation underlines the indispensability of stakeholder perspectives in the subsequent research phase.

8.1.4 Interview integration: validation, updating, and system depth

The interview phase addressed this limitation directly. As Appendix H4 describes, the integration of stakeholder perspectives substantially improved the understanding of the prevention system and strengthened the reliability of the multi-actor system diagrams. Interviews revealed implementation challenges, informal actor dynamics, and practical barriers that are largely absent from policy documents and that explain why formally established causal relations systematically underperform their assumed effects. A system perspective makes visible what a single-instrument evaluation cannot: that adjacent systems actively respond to health interventions in ways that attenuate or neutralise their intended effects, and that this adaptive dynamic is a feature of complex policy environments rather than an exceptional event. The interview phase also demonstrated the added value of combining documentary evidence with practitioner knowledge specifically for the validation of assumed causal relations. Several assumed arrows in the current-state and hypothetical diagrams could only be confirmed, disconfirmed, or respecified on the basis of practitioner experience. The prevalence of dotted arrows in the validated diagram versions (2.0, 2.1, and 2.2) is itself a substantive finding: the gap between formal policy intent and practical effect is not an anomaly but a pattern that repeats across actors and domains. These insights provided the evidential basis for respecifying the diagrams in ways that more accurately represent the system as it operates rather than as it is intended to operate.

8.1.5 Persistent limitations of the diagram method

Two methodological limitations remained even after interview integration and are worth acknowledging explicitly. The first concerns actor heterogeneity. Throughout the research, organisations such as VWS, VNG, LHV, and ZN were treated as single actors with coherent objectives and means. Interviewees consistently described a different reality: perspectives on prevention differ substantially between individuals within the same organisation, and implementation outcomes depend heavily on which specific professionals are responsible for a given programme or instrument. Interviewee I1 raised this directly as a methodological concern, questioning whether the multi-actor system diagram can capture the full complexity of individual variation within actor groups and noting that a general practitioner trained at one institution may approach cardiovascular risk assessment for women very differently from a colleague trained elsewhere. This observation is particularly significant for diagram 1.0, where LHV training on sex-specific CVD risk is modelled as a uniform causal input: in practice, the effect of that training depends substantially on the individual GP's prior knowledge, caseload, clinical orientation, and institutional context, none of which are representable as a single node in the diagram.

The second persistent limitation concerns individual behaviour as a determinant of prevention effectiveness. Whether citizens participate in cessation programmes, engage with lifestyle interventions, or use exercise infrastructure depends on intrinsic motivation, social support, and personal circumstance in ways that aggregate causal relations cannot adequately represent. The multi-actor system diagram is a tool for understanding system structure and actor dynamics; it is not a model of individual decision-making or motivational processes. Strengthening CVD prevention policy for women requires both kinds of understanding, and the diagram method as applied in this thesis addresses only the systemic dimension.

Taken together, the iterative development of the multi-actor system diagram across six versions demonstrated that the method is genuinely valuable for structuring complex health policy problems and for making features of the prevention system visible that documentary or epidemiological analysis alone cannot detect. The progressive refinement from version 0.0 to versions 2.0, 2.1, and 2.2 illustrates that its analytical value increases substantially when documentary sources are combined with practitioner knowledge, and when the distinction between intended and validated causal relations is maintained rigorously throughout. At the same time, the method has representational limits, particularly around actor heterogeneity and individual behaviour, that should be accounted for in any interpretation of its findings.

8.2 Limitations

Several limitations arise from the chosen research design, methods, and data sources that extend beyond the diagram-phase reflections addressed in section 8.1.

The construction of the system diagram requires subjective decisions regarding system boundaries, actor selection, and the inclusion of relationships between factors. Different researchers could reasonably make different choices, potentially resulting in alternative

representations of the same system. Although these decisions are informed by literature, policy documents, and interview data, researcher interpretation remains unavoidable. To improve transparency, assumptions and modelling choices are documented explicitly throughout the thesis and in the appendix tables.

A further limitation of the diagram method concerns its static, synchronic character. The multi-actor system diagrams represent the prevention system as it is organised at a particular moment in time. The system is, however, dynamic: actor objectives shift, policy frameworks are renegotiated, reimbursement conditions change, and new evidence alters clinical practice. Threshold effects, non-linear dynamics, and the temporal sequencing of causal pathways are not representable in the static diagram format. The validated diagrams (versions 2.0, 2.1, and 2.2) reflect the system as understood at the time of data collection and should not be treated as stable representations that will remain accurate as the policy context evolves.

A further limitation concerns the evidence base on which the literature review and the construction of diagram 1.0 rely. A central finding of this thesis is that the cardiovascular medical evidence base is male-biased, with research conducted predominantly on male populations and applied to women without adequate adjustment for sex-specific differences. This finding is both a substantive result and a methodological constraint: the women-specific policy interventions identified in Chapter 6 are themselves derived from a literature that is incomplete with respect to the populations it is intended to describe. The knowledge ceiling identified in the analysis is therefore also present in the analytical inputs on which the research rests.

The interviews themselves introduce additional limitations. The number of interviewed actors is necessarily limited by time and access constraints, meaning that not all relevant perspectives are included. More specifically, the interview sample does not include the perspective of citizens or patients, which is particularly significant given that Theme 6 of the thematic analysis identifies citizen ownership and co-creation as conditions for durable prevention. The voices of the populations whose health behaviour prevention policy is designed to change are entirely absent from the empirical foundation of this research. Additionally, the sample is unequally distributed across sectors: Sector 3 (Public Health and Prevention) is represented by three interviewees, while Sectors 1 and 2 are each represented by a single interviewee. This imbalance means that findings associated with the public health and prevention framing are supported by a broader evidential base than findings from other sectors. The sample was constructed through purposive and snowball sampling, which introduces the risk that interviewees share professional networks and therefore perspectives that are not fully representative of the diversity of positions within each sector. Moreover, interviewees provide interpretations based on their own experiences, interests, and professional backgrounds, and their perspectives should not be interpreted as objective representations of the system.

Finally, the scope of this thesis is limited to cardiovascular disease prevention for adult women in the Netherlands. Broader contextual influences, such as international developments, wider societal trends, and interactions with other health policy domains, are only included when directly relevant to the prevention system under study. While this demarcation is necessary to

keep the research manageable, it inevitably excludes factors that may influence real-world outcomes. The findings are specific to the Dutch healthcare context, with its particular combination of Zvw reimbursement architecture, municipal governance through GALA, and national policy coordination through the NPA. The extent to which the analysis and its conclusions transfer to other national healthcare systems with different institutional arrangements requires careful consideration.

Despite these limitations, the combination of grey literature, scientific literature, actor analysis, and interview-based validation provides a systematic and transparent approach to developing a multi-actor understanding of the Dutch CVD prevention system. By explicitly reflecting on the strengths and limitations of the multi-actor system diagram throughout the research process, this thesis not only generates insights into CVD prevention policy but also contributes to understanding the applicability of this method for analysing complex public health problems.

9. Conclusion

9.1 Answering sub-questions

SQ1: How is cardiovascular disease prevention for women currently organised within the Dutch health system?

Cardiovascular disease prevention in the Netherlands is organised through four interlocking national policy frameworks: the National Prevention Agreement (NPA, 2018), the Integrated Care Agreement (IZA), the Healthy and Active Life Agreement (GALA), and the Additional Health and Wellbeing Agreement (AZWA). Each framework contributes a distinct instrument set: the NPA focuses on reducing smoking, overweight, and alcohol use through voluntary sectoral commitments; the IZA and GALA embed prevention within primary care and municipal health programming respectively; and the AZWA extends this logic by prioritising health promotion before medical intervention is required. At the European level, the Safe Hearts Plan (2025) establishes cardiovascular health as an explicit strategic priority and is the first EU-level framework to name women as a population requiring additional preventive attention.

The Dutch CVD prevention system operates through a layered multi-actor structure in which national policy authority rests with VWS, reimbursement is controlled by ZN through the Zvw framework, VNG coordinates municipal implementation through GALA co-funding, and LHV represents primary care in the governance of lifestyle intervention referrals. This cooperative structure is counterbalanced by commercial conflict actors, the tobacco industry and the commercial food sector (KHN), whose market strategies actively sustain the risk behaviours the cooperative system aims to reduce.

The central finding of this sub-question is that none of the four national policy frameworks explicitly account for sex-specific cardiovascular risk. Women are addressed as members of the general population rather than as a group whose cardiovascular risk profiles, risk trajectories, and barriers to prevention differ systematically from those of men. Female-specific risk determinants, including hormonal change across the life course, adverse pregnancy outcomes such as hypertensive disorders of pregnancy and preeclampsia, and reproductive conditions such as PCOS, are absent from the NPA, IZA, GALA, and AZWA. The system diagrams constructed in Chapter 4 show that current policy instruments interact with reinforcing feedback dynamics that sustain risk behaviours independently of formal intervention, and that RIVM projections consistently find the NPA targets for 2040, for both smoking and overweight, to be unlikely to be met under current policy conditions.

SQ2: Which actors shape the Dutch CVD prevention system for women?

The Dutch CVD prevention system is shaped by a multi-layered actor landscape spanning European, national, and municipal levels, as constructed in Chapter 5. Rather than a single coordinating authority, the system operates through the parallel and often loosely coupled

actions of actors whose objectives, resources, and institutional mandates are only partially aligned.

At the national level, VWS holds the primary policy mandate but functions in practice as a collection of separate programme domains that do not consistently translate shared goals into coordinated implementation. ZN governs the reimbursement gateway through the Zvw framework, making access to prevention programmes such as the GLI and smoking cessation support dependent on a care production logic rather than a health outcome logic. LHV represents primary care at the critical interface between policy instruments and the populations they are meant to reach, but general practitioners operate under workload conditions that constrain what policy intentions can achieve in practice. EZK holds fiscal authority over tobacco excise policy, a domain central to smoking prevention but institutionally separated from the health mandate of VWS. VNG coordinates municipal implementation of GALA-funded prevention programmes, but GALA funding is frequently absorbed at the provincial level before reaching the municipalities intended to use it. GGD provides the public health bridge between national policy and local populations, but its reach is constrained by municipal capacity and budget variability across the 260-plus municipalities it serves. RIVM generates monitoring infrastructure that consistently shows current trajectories are insufficient, but monitoring output does not automatically translate into policy adjustment. ZIN functions as a knowledge and norm-setting actor whose formal assessments shape the conditions under which ZN makes reimbursement decisions, as demonstrated by the 2023 Signalement Hart voor Vaten.

Commercial actors constitute the second category of system participants, with a structural role qualitatively different from that of the cooperative actors above. The tobacco industry's commercial objective is directly in tension with the public health goals of every other system actor. KHN uses its lobbying capacity to resist mandatory reformulation requirements, limiting the effectiveness of food environment instruments available to cooperative actors. Two systemic features emerge from this analysis: no actor holds an explicit mandate to address sex-specific CVD risk for women, and the formal actor positions captured in Chapter 5 do not reflect the informal dynamics, mutual dependencies, and coordination failures that determine how the system actually functions. These are only made visible through the actor perspectives examined in Chapter 7.

SQ3: Which policy interventions can be identified to strengthen CVD prevention for women within the Dutch health system?

A targeted review of the scientific literature, structured in Chapter 6, identified twelve evidence-based policy interventions for CVD prevention in women across three domains: sex-specific risk identification in primary care, direct behavioural prevention targeting smoking and overweight among women, and improvements in coverage and data quality. Four of the twelve interventions met all selection criteria and were sufficiently operationalisable to translate into actor means within multi-actor system diagram 1.0. Each is designed to fit within the existing mandate of the assigned actor, rather than requiring the assignment of new institutional responsibilities.

The first is GP training on sex-specific CVD risk factors, assigned to LHV. Evidence demonstrates that hormonal changes, PCOS, and adverse pregnancy outcomes independently elevate long-term CVD risk, and that current clinical guidelines applied in Dutch primary care do not systematically incorporate these factors into cardiovascular risk assessments for women. The second is a sex-specific smoking cessation outreach programme, assigned to GGD in collaboration with ANR. Evidence identifies intensive behavioural counselling combined with nicotine replacement therapy and exercise counselling as substantially more effective for female smokers than generic cessation approaches. The third is a Zvw-reimbursed lifestyle programme extending GLI eligibility to women with sex-specific CVD risk profiles, assigned to ZN. The fourth is investment in safe physical activity infrastructure, assigned to VNG. Evidence consistently identifies access to safe, women-accessible public space as a prerequisite for sustained physical activity among women (Shahid et al., 2024).

Together, these four interventions are represented as actor means in diagram 1.0, which maps their causal pathways through the system and shows two dynamics that individual evaluation would not detect: a reinforcing loop (R1) linking chronic stress and cessation failure that specifically undermines cessation programme effectiveness among women in high-stress circumstances, and a balancing pathway (B1) through which VNG infrastructure investment depletes the municipal health budget it depends on, introducing a constraint on the scalability of municipal prevention.

SQ4: How do actors perceive the system of CVD prevention for women?

The thematic analysis of seven semi-structured interviews, conducted using Braun and Clarke's (2006) six-phase approach and hybrid deductive-inductive coding in Atlas.ti, produced six themes that together characterise actor perceptions of the CVD prevention system. The first theme, economic logic drives and limits prevention, reflects the curative incentive architecture of the Zvw, which creates a financial disadvantage for prevention investment that corrective pathways through reimbursement instruments consistently compete against. The second theme, policy is designed from a filtered reality, describes the recurring pattern in which prevention policy is formulated from an expert-based, aggregated perspective that does not reflect the financial insecurity, time constraints, and social circumstances that shape health behaviour in practice. The third theme, conflicting system logics undermine prevention, identifies a fundamental incompatibility between the health system and commercial, digital, and market systems that actively adapt to neutralise health interventions. The fourth theme, fragmented responsibility blocks systemic change, describes a prevention system in which accountability for health outcomes is diffuse and ultimately owned by no single actor, with coordination structures frequently adding institutional complexity rather than resolving it. The fifth theme, women's health needs systematically overlooked across domains, confirms that the invisibility of women in CVD prevention operates simultaneously and independently in scientific, clinical, and spatial domains. The sixth theme, ownership and co-creation as conditions for lasting change, identifies genuine citizen participation as a cross-cutting prerequisite for durable prevention, with

top-down approaches consistently generating defensiveness rather than engagement in communities where institutional trust is already low.

SQ5: How do actor perspectives update and validate the understanding of the Dutch CVD prevention system for women?

The interviews served three analytical functions in relation to the multi-actor system diagrams constructed in Chapters 4 and 6: deepening the understanding of system dynamics, introducing new elements absent from the documentary evidence base, and validating or respecifying assumed causal relations. In the overweight sub-system (2.1), social media amplification of the normalisation loop, point-of-sale decision complexity, actor coordination failure, and the SES-to-chronic-stress mechanism were introduced or validated. In the smoking sub-system (2.2), autonomous behavioural trends as a counterfactual to policy attribution, product substitution as a mechanism through which excise tax increases underperform, and the policy-design consequences of the tobacco industry's formal exclusion were established. In the women-specific sub-system (2.0), medical research gender bias as a ceiling on training intervention effectiveness, and perceived safety in public outdoor space as a sex-specific barrier to physical activity independent of infrastructure availability, were added as new elements. Across all three diagrams, the prevalence of dotted arrows in the validated versions constitutes a systemic finding: the gap between formal policy intent and practical effect is not an anomaly but a pattern that repeats across actors and domains.

9.2 Answering main question

By answering the sub-questions in section 9.1, the main research question of this thesis can be answered:

How can a system-informed analysis of the Dutch health system support the strengthening of cardiovascular disease prevention policy for women in the Netherlands?

The multi-actor system diagram contributes to strengthening CVD prevention for women in three distinct ways. First, it makes visible what documentary and epidemiological analysis alone cannot show. The reinforcing feedback loops in the validated overweight and smoking sub-systems explain why risk behaviour persists despite sustained prevention investment: in sub-system 2.2, chronic stress suppresses cessation success among female smokers, which sustains chronic stress, creating a cycle that generic cessation programmes are not designed to break. The prevalence of dotted arrows across all three validated diagrams is not a modelling artefact but a substantive finding: the Dutch prevention system regularly produces policy instruments whose assumed causal mechanisms are interrupted before reaching their intended outcomes, and the diagram makes this gap visible as a system-wide pattern rather than an isolated implementation failure.

Second, the diagram identifies concrete leverage points within existing actor mandates where women-specific interventions can be operationalised without requiring new institutional

structures. LHV can update the NHG CVRM guideline to create a clinical obligation for general practitioners to assess cardiovascular risk in women with adverse pregnancy outcomes, PCOS, or premature menopause, groups currently invisible in standard risk assessment protocols. ZN can extend GLI eligibility under existing Zvw authority to women whose CVD risk is driven by hormonal and obstetric factors not captured by current BMI-based criteria. GGD can deploy a sex-specific smoking cessation outreach programme through GALA in collaboration with ANR, targeting the distinct cessation barriers female smokers face. VNG can intensify physical activity infrastructure investment, specifically in urban areas where women face safety barriers that make existing infrastructure inaccessible in practice. Each of these is an action an existing actor can take within its current mandate: the diagram makes the actor-intervention assignment explicit.

Third, the iterative validation through actor perspectives specifies under what conditions each intervention can succeed. ZN's expansion of GLI eligibility requires an explicit cost-benefit argument and external policy pressure from VWS, since the curative incentive architecture of the Zvw does not automatically reward preventive investment. LHV's guideline update will only produce practice change if accompanied by implementation tools, such as embedded clinical decision aids, that reduce rather than add to GP workload. The multi-actor design of both the cessation programme and the GLI expansion depends on coordination that no single actor currently initiates, pointing to the need for VWS to anchor these interventions in GALA performance agreements rather than voluntary commitment. T5 confirms the absence of women in both the cardiovascular evidence base and the spatial design of prevention infrastructure, validating the diagnosis from which all four interventions depart and underscoring the need for RIVM to mandate sex-disaggregated monitoring as a precondition for evaluating their effect.

Taken together, the iterative development of the multi-actor system diagram across six versions, from diagram 0.0 through the sub-system diagrams 0.1 and 0.2, the hypothetical women-specific diagram 1.0, and the interview-validated final diagrams 2.0, 2.1, and 2.2, demonstrates that a system-informed approach can do what targeted intervention studies and policy documents alone cannot: it maps the full actor landscape, traces the causal pathways through which interventions are expected to work and fail, and identifies where women-specific CVD prevention can be built into existing structures rather than requiring actors to wait for the resolution of the systemic coordination failures that the analysis itself identifies as the primary obstacle.

At the same time, the method has real limitations that qualify this contribution. The diagram represents actors as homogeneous units, while interviewees consistently emphasised that perspectives on prevention differ considerably within organisations and that individual motivation shapes how mandates are used in practice. Governance dynamics, such as the diffuse ownership of prevention outcomes and the informal dependencies between actors, are difficult to capture through causal arrows between variables, and several of the most significant system features identified in the interviews proved resistant to graphical representation. The diagram also cannot adequately model individual behavioural variation: whether a woman participates in a cessation programme or uses a physical activity facility depends on personal circumstances,

social context, and motivational factors that a system-level model necessarily flattens. The multi-actor system diagram should therefore be understood as a structured simplification that supports system understanding and makes assumptions explicit, rather than as a complete representation of how the prevention system operates. Its value lies not in the final diagrams alone but in the iterative process of constructing, challenging, and refining them through multiple sources of evidence.

9.3 Recommendations for policy and practice

The five recommendations below are grounded in the actor-mandate logic of the multi-actor system diagram: each is assigned to an actor with the formal authority to act, and each is implementable within existing frameworks. The central design principle is that women-specific CVD prevention interventions can be operationalised now, by working through existing mandates rather than waiting for the resolution of the responsibility fragmentation that T4 identifies as the primary obstacle to systemic change.

Current GALA performance agreements specify output targets without disaggregating by sex, leaving municipalities with no measurable accountability for whether women are actually reached. Adding sex-disaggregated participation and physical activity indicators to GALA output agreements would convert the subsidy relationship between VWS and VNG from activity-based into outcome-based accountability. The GALA framework already allows VWS to condition SPUK disbursement on output criteria; making a portion of SPUK allocations conditional on measurable progress against sex-specific physical activity targets in deprived postcodes would create a performance mechanism that currently does not exist, without requiring new legal authority.

Sub-system 2.0 and interviewee I2 establish that physical activity infrastructure fails women when it is not designed for their actual conditions of use: women who do not feel safe in outdoor public spaces cannot translate available infrastructure into physical activity regardless of its technical quality. National guidance should specifically require sex-specific urban design criteria covering lighting, sight lines, route connectivity, and group exercise infrastructure. This operationalises VNG's existing spatial planning mandate and directly addresses the safety barrier identified in diagram 2.0, which is currently invisible in both CVD prevention and physical activity policy.

ZIN's 2023 Heart for Vessels report advocates a shift from curative to preventive care and identifies the limited effectiveness of predominantly medical approaches as a systemic challenge. A follow-up ZIN Signalement specifically addressing PCOS, hypertensive disorders of pregnancy, and hormonal risk at menopause would create a formal knowledge mechanism with direct implications for ZN's reimbursement decisions. Under the Zvw framework, ZIN assessments inform the definition of appropriate care and thereby condition what ZN is expected to cover; a targeted Signalement on female CVD risk would provide ZN with the normative basis to extend GLI eligibility to women with sex-specific risk profiles without requiring any change to the Zvw framework itself. The B1 balancing pathway in diagram 1.0, where GP

workload constrains the practical effect of training, underlines why reimbursement expansion through ZN is the mechanism with the greatest potential to change what reaches the patient level.

GGD-municipality services do not include sex-specific cessation targets, so GGD outreach capacity is not explicitly directed toward female smokers despite the system analysis identifying them as insufficiently reached by generic cessation pathways. Adding sex-specific cessation reach targets to these contracts would direct GGD's outreach mandate toward the identified gap without requiring new resources and would create a monitoring mechanism through which RIVM can track progress on a sex-disaggregated basis. The R1 reinforcing loop in diagram 1.0, in which chronic stress and cessation failure sustain each other among women in high-stress circumstances, grounds the need for a sex-specific programme design integrating psychosocial support in the system structure rather than in clinical preference alone.

T1 identifies employer-funded prevention as economically justifiable through reduced absenteeism even where the Zvw architecture does not provide incentives. Cardiovascular disease is a leading cause of absenteeism among women aged 40 to 65, and occupational health services already hold a periodic health examination mandate. A VWS-coordinated agreement with employer organisations, building on the existing Vital Company programme, could establish sex-specific CVD risk screening as a standard component of periodic occupational health examinations for women over 40. This reaches women through workplace settings identified as high-priority outreach channels in the scientific literature (Suh et al., 2023) and does not depend on the Zvw reimbursement architecture.

Taken together, these recommendations share a common design logic: they create accountability for women-specific CVD prevention within existing mandates by introducing specific mechanisms, whether a performance target, a design standard, a formal knowledge trigger, a contract specification, or an economic incentive, that connect an actor's existing authority to a measurable outcome for women's cardiovascular health. The central obstacle is not the absence of suitable instruments but the absence of mechanisms that ensure those instruments reach the populations they are designed for.

9.4 Recommendations for future research

The findings and methodological reflections of this thesis point to several directions for future research that would build on and extend the analysis developed here.

The most immediate recommendation concerns the composition of the interview sample. The seven semi-structured interviews conducted for this thesis were deliberately selected to include actors with broad system knowledge and cross-sector perspectives, making them well-suited for developing a general understanding of the prevention system and its dynamics. They were not primarily selected on the basis of whether the interviewee holds a formal position in the system diagram itself. Future research should extend the interview sample to include actors in formal policy roles within the multi-actor system as represented in diagrams 2.0, 2.1, and 2.2:

representatives of VWS, ZN, LHV, VNG, GGD, ANR, and the tobacco industry. Interviewing actors at this level would enable a more precise analysis of conflict and collaboration dynamics, and would make it possible to directly probe willingness to implement the women-specific policy interventions proposed in diagram 1.0 and to assess under what conditions each actor would consider those interventions feasible and politically acceptable. This kind of actor-level engagement moves the analysis from system understanding toward action-oriented policy dialogue.

A specific methodological extension that would strengthen diagram validity is the use of diagram-based interviews in future research. Rather than presenting the diagram as an output after the interviews are complete, future studies could conduct semi-structured interviews in which the diagram itself serves as the stimulus material. Showing the diagram to actors and asking whether it accurately represents their experience, where they would challenge a causal relation, and whether the actor assignments reflect actual institutional responsibilities would generate more targeted validation data than the interview approach used in this thesis, and would allow the diagram to be refined iteratively through direct practitioner feedback.

A connected recommendation concerns the sex-disaggregated monitoring infrastructure on which the accountability mechanisms proposed in section 9.3 depend. A persistent limitation of the analysis is that sex-disaggregated prevention data is sparse across all domains examined. Future research should support the development of sex-disaggregated monitoring indicators within RIVM's existing prevention monitoring framework, covering programme participation, physical activity levels, smoking cessation rates, and cardiovascular risk outcomes by sex and by socioeconomic position. Without this data foundation, the performance targets and contract specifications recommended in section 9.3 cannot be evaluated against actual outcomes, and the intent-effect gap identified across the system diagram will remain empirically invisible.

Finally, a system dynamics (SD) model or agent-based model (ABM) would be a well-suited next step following the multi-actor system diagram analysis. The iterative diagram development conducted in this thesis provides the structural foundation that such models require: it has identified the key system factors, the actors and their means, the causal pathways connecting them, and the feedback loops that sustain risk behaviours. A system dynamics model could formalise these relationships quantitatively and simulate how the system evolves over time under different policy scenarios, including the women-specific interventions proposed in diagram 1.0 (Hirsch et al., 2010; Ter Ellen et al., 2025; Zheng et al., 2025). An agent-based model would complement this by simulating the behaviour of individual actors and citizens rather than aggregate system flows, making it possible to represent the individual variation and motivational heterogeneity that the diagram method cannot adequately capture (Waterlander et al., 2025). Used together, these methods would constitute a substantially more powerful analytical toolkit for addressing complex public health problems of the kind examined in this thesis.

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Appendices

Appendix A: Multi-actor system diagrams

A1: Sub-system diagram 0.1: Overweight/obesity

Figure A1.1 maps the overweight/obesity prevention sub-system as organised under the NPA (Ministerie van VWS, 2018), incorporating five actors, three external factors, and nine internal system factors. The colour-coding convention applied throughout distinguishes the evidential basis of each causal relation: black arrows represent relations formally established in policy documents; blue arrows reflect findings from scientific or evaluation literature; and red arrows indicate assumed connections. Dotted arrows indicate intended but unconfirmed relationships.

VWS acts as the national policy principal. Its primary operational NPA instrument is the introduction of the Nutri-Score food labelling system, intended to reduce consumption of unhealthy food, shown as a dotted black arrow as the policy intent is formally established but RIVM evaluation confirms a negligible effect on BMI (Eykelboom et al., 2023). VWS also sets overweight reduction targets for 2040; the assumed accountability pathway through which these targets reduce overweight prevalence is shown as a red arrow. The causal chain from VWS's instruments runs through overweight prevalence and CVD risk to the actor's goal of low CVD prevalence among adult women.

ZN reimburses the GLI for adults with overweight or obesity, intended to increase programme participation and thereby reduce unhealthy dietary behaviour. This arrow is dotted and black: despite formal coverage since 2019, participation remains low and population-level impact limited (Eykelboom et al., 2023; Zorginstituut Nederland, 2023). The GLI pathway (GLI participation rate → consumption → overweight prevalence) represents a corrective pathway in the system, though not a feedback loop.

VNG represents municipalities, which under GALA co-fund two types of local interventions: healthy food environment improvements and sport and exercise provision. The healthy food environment instrument is connected to improved healthy food availability; the sport and exercise instrument is connected to a higher physical activity level, both shown as solid black arrows reflecting formally established GALA commitments (Ministerie van VWS, 2023). An RIVM evaluation confirms that 82% of municipalities report GALA has provided additional impetus to sport and exercise activities (RIVM, 2025). Both internal factors in turn reduce overweight prevalence.

Fast food restaurants and KHN are included as commercial conflict actors. Fast food restaurants drive unhealthy food consumption through marketing of energy-dense products, reinforcing both the R1 and R2 system dynamics (Ter Ellen et al., 2025; Waterlander et al., 2025). KHN's lobbying against mandatory advertising restrictions and reformulation requirements maintains high unhealthy food consumption, represented as a red arrow inferred from the RIVM observation that many NPA measures lack enforceability (RIVM, 2024). Both actors' goals, hospitality and fastfood sector revenue (€/year), are served by high levels of unhealthy food consumption.

Two external factors shape the system from outside its boundary. Adverse socioeconomic status of target group (SES) drive demand for cheap, calorie-dense food, providing the entry point for the R3 dynamic (Ter Ellen et al., 2025). The structural power imbalance between internationally branded unhealthy retailers and healthy local food outlets increases fast food restaurant density and reduces healthy food availability (Waterlander et al., 2025). Aging population independently increases CVD risk.

Three reinforcing feedback loops are represented in the diagram through blue arrows. R1 (obesogenic food system) runs through the bidirectional connection between consumption of unhealthy food and normalisation of unhealthy dietary patterns (Ter Ellen et al., 2025). R2 (price-accessibility) is now a complete loop: higher fastfood restaurant density reduces the price of unhealthy food, increasing consumption, which in turn drives market expansion, adding more outlets (Waterlander et al., 2025; Ter Ellen et al., 2025). R3 (socioeconomic stress) enters the diagram through SES as an external factor; the loop closes outside the diagram boundary. The GLI corrective pathway (ZN reimbursement → GLI participation → reduced consumption) is present but partially broken due to low participation rates (Eykelboom et al., 2023). A full specification of all causal relations is provided in Appendix B1 (Table B1.1).

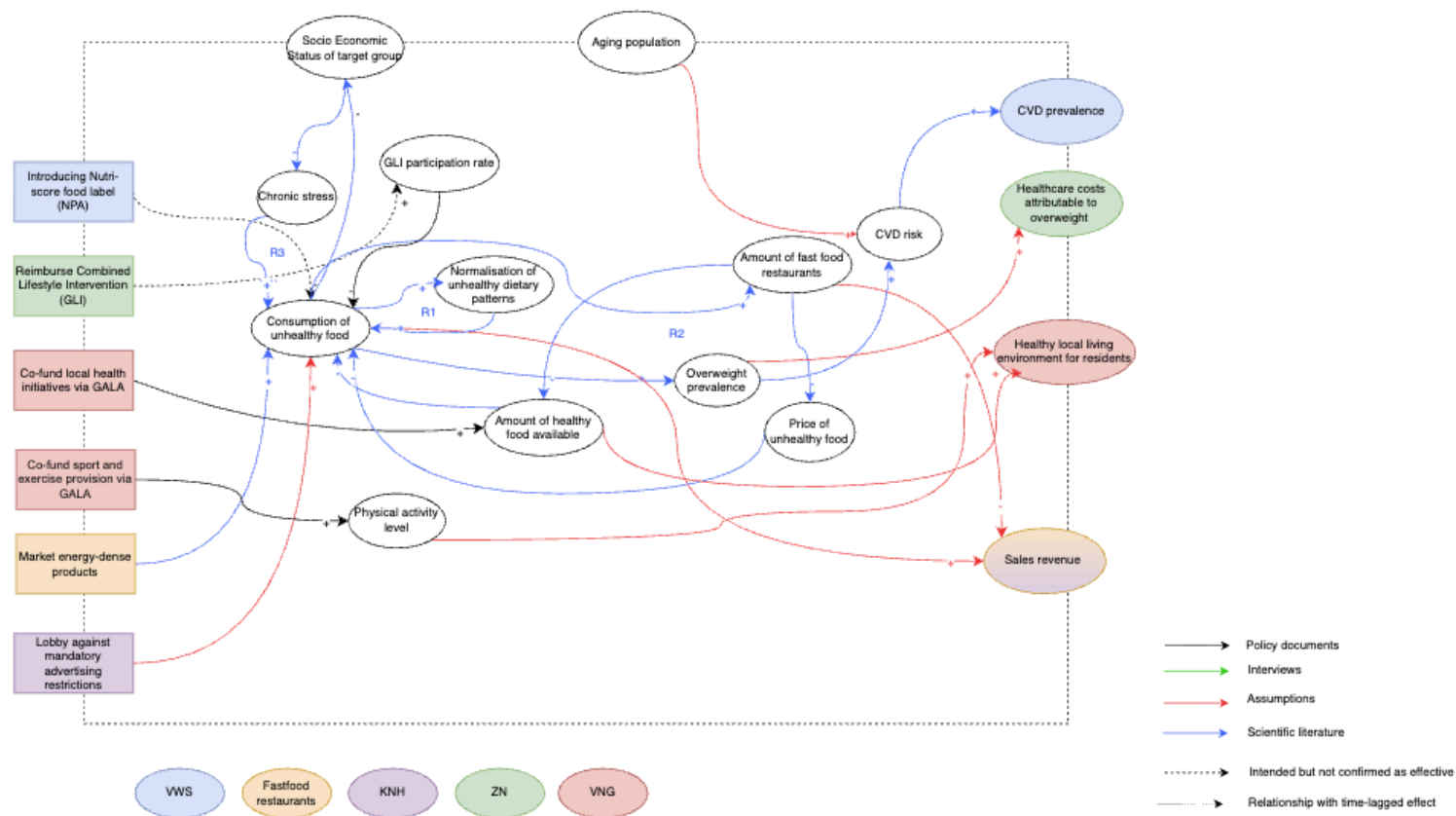


Figure A1.1: Multi-actor sub-system diagram overweight/obesity, showing the current obese prevention policy in the Netherlands (own work)

A2: Sub-system diagram 0.2: Smoking

Figure A2.1 maps the smoking prevention sub-system as organised under the NPA (Ministerie van VWS, 2018), incorporating six actors, three external factors, and nine internal system factors. The same colour-coding convention applies as in Figure A1.1: black arrows represent relations formally established in policy documents; blue arrows reflect findings from scientific or evaluation literature; and red arrows indicate assumed connections. Dotted arrows indicate intended but unconfirmed relationships. A full specification of all causal relations is provided in Appendix B2 (Table B2.1).

EZK is included as a separate actor because raising tobacco excise taxes, the single most effective NPA instrument for reducing smoking prevalence (Kuijpers et al., 2023), falls under the fiscal policy mandate of the Ministry of Economic Affairs and Climate Policy rather than VWS. EZK's means directly raises the price of tobacco products, which in turn reduces smoking prevalence through a price-deterrence mechanism: the 2024 excise increase of 30.7% was associated with a 6.1% adult prevalence reduction (Kuijpers et al., 2023). EZK's goal is a measurable reduction in tobacco consumption through fiscal deterrence.

VWS contributes two complementary instruments within the NPA. The introduction of mandatory smoke-free environments, smoke-free schoolyards from 2020, closure of smoking rooms in hospitality settings, and standardised packaging requirements, reduces social normalisation of smoking (Ministerie van VWS, 2018; Kuijpers et al., 2023). VWS also progressively restricts the number and density of tobacco sales points through display bans, advertising restrictions, and phasing out of vending machines (Ministerie van VWS, 2018; Kuijpers et al., 2023). VWS's goal is a smoking prevalence below 5% among adults by 2040, with zero smoking during pregnancy; Kuijpers et al. (2023) project that even with full NPA implementation, the realistic estimate for 2040 is approximately 10%, placing the NPA target out of reach under current policy.

ZN finances smoking cessation support through reimbursement of first-line cessation programmes free of the mandatory deductible, effective from 2020. This instrument is represented by a dotted black arrow: although formal coverage has improved, Kuijpers et al. (2023) find that only 7.4% (2018) to 9.3% (2020) of smokers attempted to quit using formal care, and population-level impact remains limited. ZN's goal is to reduce preventable healthcare costs from smoking-related disease (€/year).

VNG supports municipalities in implementing the Rookvrije Generatie (smoke-free generation) approach, committing local governments to smoke-free public environments and contributing to the denormalisation of smoking. VNG's goal is a measurable increase in smoke-free public environments across municipalities.

ANR (Alliantie Nederland Rookvrij) is included as a civil society actor whose public awareness campaigns contribute to shifting the social norm around smoking. By coordinating advocacy and public communication across its coalition of approximately 150

organisations, ANR reinforces the denormalisation efforts of VWS and VNG, and reaches citizens at risk directly through campaigns and education. ANR's goal is to realise a smoke-free society in the Netherlands.

The tobacco industry is included as a commercial conflict actor whose interests directly oppose those of the other actors in the system. Its means; marketing tobacco products through advertising, strategic pricing, and targeted outreach in socially vulnerable communities, and lobbying against mandatory restrictions, counteract the denormalisation efforts of the other actors. Tobacco industry marketing sustains the social norm around smoking (Wilde, n.d.; Mills et al., 2021), shown as a blue arrow; lobbying maintains the density of tobacco sales points through policy resistance (Wilde, n.d.), shown as a red arrow. The tobacco industry's goal is high tobacco sales revenue (€/year).

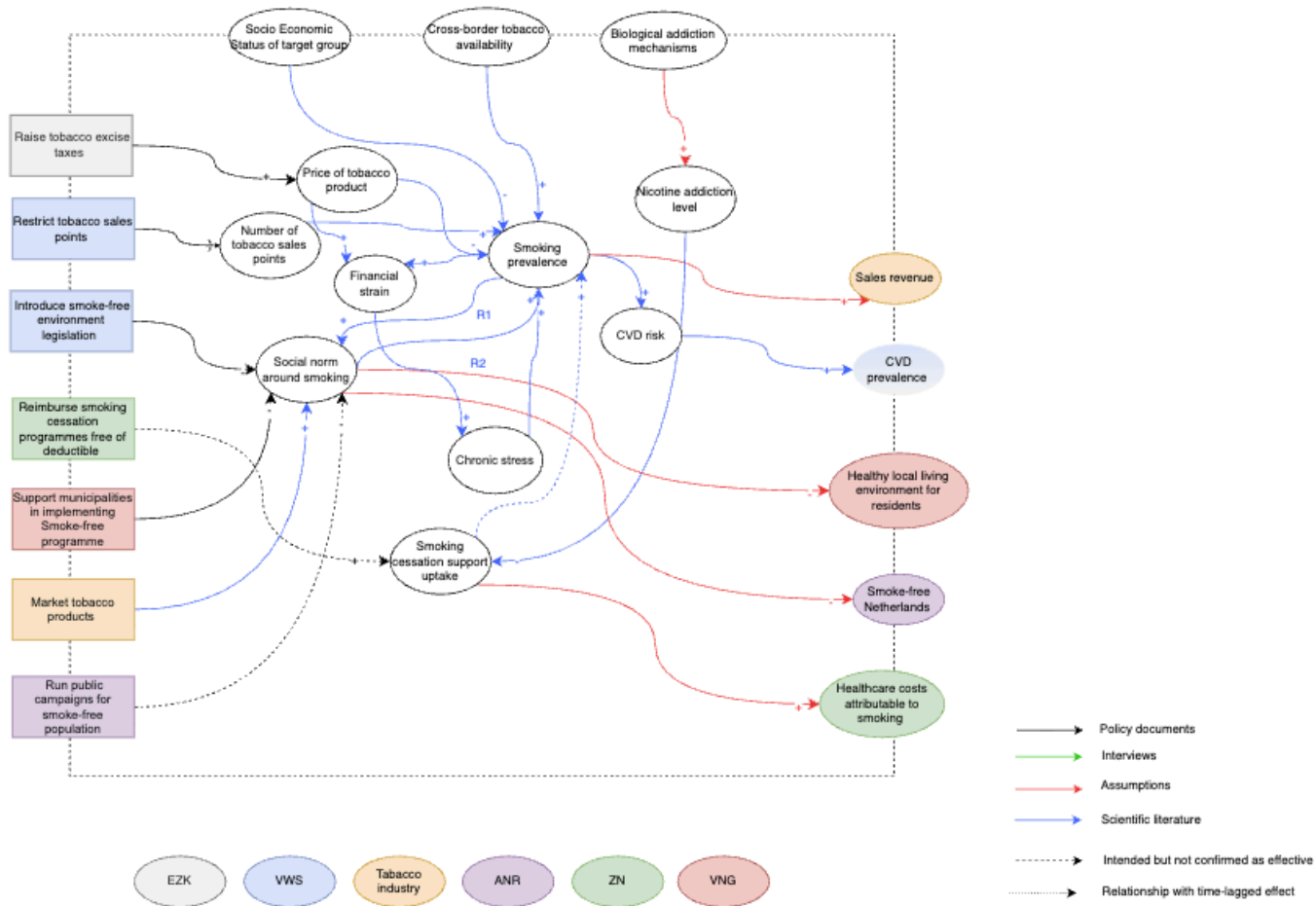


Figure A2.1: Multi-actor sub-system diagram smoking, showing the current smoking prevention policy in the Netherlands (own work)

A3: System diagram 1.0: women-specific

Figure A3.1 maps four proposed policy interventions for women's CVD prevention as a multi-actor system diagram, following Enserink et al. (2022). Unlike the sub-system diagrams in Chapter 5, which map the current Dutch CVD prevention system, this diagram is explicitly hypothetical: it models how the system could function if selected evidence-based interventions from Section 6.1 were implemented.

Two external factors shape the system from outside its boundary, consistent with the approach taken in sub-systems 0.1 and 0.2. Socioeconomic conditions (SES) appear as an external factor in both preceding sub-systems and operate here through three pathways: low SES independently elevates CVD risk in women via financial barriers to healthy food and lower physical activity; it drives chronic psychosocial stress through financial strain and caregiving burden; and it reduces uptake of the proposed lifestyle programme despite Zvw reimbursement, through time constraints and lower health literacy (Shahid et al., 2024; Gaffey et al., 2025).

Hormonal and reproductive biology constitutes a second external factor specific to this sub-system. Sex-specific biological mechanisms, including estrogen decline at menopause, PCOS-related hormonal dysregulation, and vascular damage arising from hypertensive disorders of pregnancy, independently elevate CVD risk beyond what traditional risk factor models capture (Gulati, 2023; Shahid et al., 2024). This factor is analogous to biological nicotine addiction in sub-system 0.2: it represents a structural baseline driver that the prevention system cannot eliminate, but whose effects can be partially mitigated through targeted intervention. Crucially, this biological complexity is the primary basis from which the scientific evidence base on female-specific CVD risk mechanisms grows: as the hormonal underpinnings of women's CVD risk become better understood, they generate international research output, guideline revisions, and pressure on GP training content, captured in the diagram as the internal factor discussed further below.

The diagram introduces eight new internal factors. Scientific evidence based on female-specific CVD risk mechanisms captures the cumulative body of clinical and epidemiological knowledge linking hormonal and reproductive biology to elevated CVD risk. This evidence base, driven externally by the biological reality of sex-specific risk mechanisms, operates through two pathways: it improves GP knowledge of sex-specific CVD risk by providing the scientific content for training materials and clinical guidelines, and it directly enhances sex-specific CVD risk identification by informing the clinical risk stratification protocols used in primary care (Kiss et al., 2024; Gulati, 2023). GP knowledge of sex-specific CVD risk captures the degree to which GPs are equipped to recognise and act on sex-specific CVD risk factors, currently low in the Netherlands (Kiss et al., 2024). Smoking cessation among women reflects the proportion of female smokers achieving sustained abstinence at six months. Smoking is a major modifiable CVD risk factor in

women, and female smokers face distinct biological and psychosocial cessation barriers not addressed by generic programmes (Suh et al., 2023). Sex-specific CVD risk identification is the key intermediate outcome: the number of women newly identified as carrying elevated CVD risk through sex-specific pathways. Women's CVD lifestyle programme uptake reflects enrolment in the proposed Zvw-reimbursed prevention programme. GP workload is introduced as a complexity factor: training GPs on additional screening protocols increases workload in a system already characterised by time pressure (Zorginstituut Nederland, 2023). Availability of local exercise facilities and equipment is the intermediate factor between VNG's infrastructure investment and physical activity: investment creates tangible facilities, which increase physical activity but deplete the municipal budget. Finally, the municipal health budget reflects the financial capacity of municipalities to sustain infrastructure investment, and serves as the indicator for VNG's goal 2 (budgetary sustainability).

Three internal factors are carried over from earlier sub-system diagrams. Physical activity level was already present in sub-system 0.1 (overweight), where VNG's GALA-funded sport provision directly influenced it. In the present diagram, VNG infrastructure investment creates exercise facilities that increase physical activity level, which in turn reduces CVD risk and lowers chronic stress. Chronic stress appeared in both sub-systems 0.1 and 0.2, operating as an entry point into reinforcing feedback loops. Here it functions as an additional sex-specific CVD risk pathway and as the entry point to the R1 reinforcing loop, discussed further below. CVD risk in women is the shared target outcome across all three sub-system diagrams.

The diagram contains one reinforcing feedback loop and two balancing pathways.

R1: reinforcing (chronic stress–cessation vicious cycle): Chronic psychosocial stress suppresses smoking cessation among women (–): it triggers relapse, suppresses quit attempts, and reduces the effectiveness of cessation interventions, particularly among women who use smoking as a stress-coping mechanism (Yong et al., 2009; Suh et al., 2023). Sustained smoking, in turn, maintains chronic stress through the nicotine withdrawal–relief cycle: the temporary stress relief of nicotine perpetuates dependence and sustains the baseline stress burden (–). The product of these two negative effects produces a reinforcing loop in which high chronic stress reduces cessation success, and lower cessation rates sustain high chronic stress, a vicious cycle that entrenches female smoking and amplifies CVD risk simultaneously through both pathways. R1 is directly opposed by the GGD cessation outreach programme, which targets both the pharmacological and the stress-management dimensions of cessation. The tobacco industry's lobbying means act as a structural reinforcement of R1 by preventing the policy expansions that would break the cycle.

B1: balancing (municipal budget constraint): VNG's investment in physical activity infrastructure creates exercise facilities, which directly increase physical activity levels, but simultaneously deplete the available municipal health budget. Lower budget constrains future investment in exercise facilities, creating a structural ceiling on sustained activity level growth unless additional funding (e.g.,

renewed GALA allocation) is secured. B2 reflects the tension between VNG's two goals: short-term investment in a healthy living environment (goal 1) competes with the financial sustainability of continued prevention investment (goal 2).

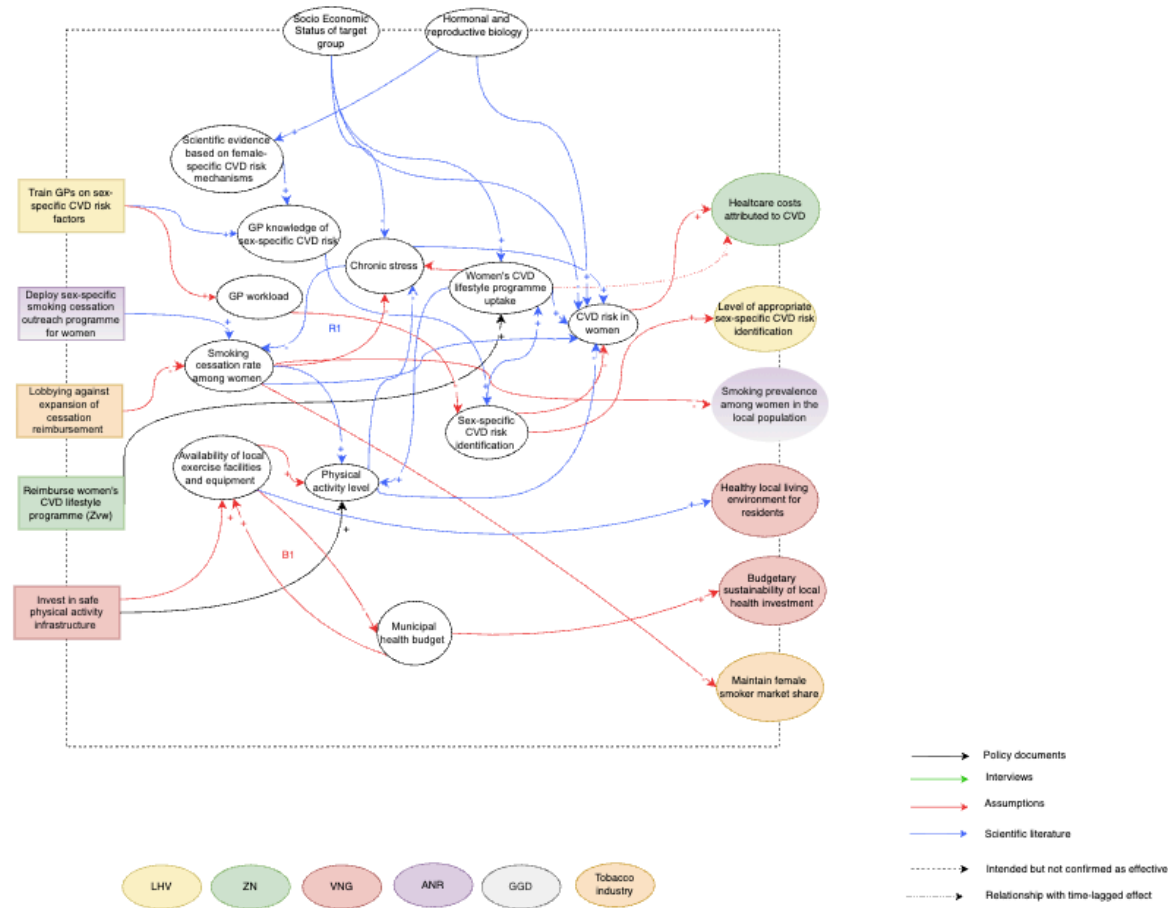


Figure A3.1: Multi-actor system diagram 1.0 women specific (own work)

Appendix B: Causal relation tables

B1: sub-system diagram 0.1 (Overweight/obesity)

Row shading indicates evidential basis: blue rows = scientific/evaluation literature; white rows = policy documents (black arrows); pink rows = assumed relations (red arrows). Striped arrows = intended but not confirmed as effective; dotted arrow = relationship with time-lagged effect.

Table B1.1: Causal relations in sub-system diagram 0.1 (Overweight/obesity)

From	To	+/-	Arrow	Feedback loop	Source
A. External factors → Internal factors					
Socioeconomic conditions (SES)	Consumption of unhealthy food	-	Solid, blue	R3	Ter Ellen et al. (2025): when socioeconomic conditions are low, more unhealthy food will be consumed due to lower prices.
Aging population	CVD risk	+	Solid, red	—	Assumption based on demographic trends, age is a non-modifiable CVD risk factor
B. Means → Internal factors					
VWS: Introduce Nutri-Score food label (NPA)	Consumption of unhealthy food [Kcal/yea/personr]	-	Striped, black	—	Policy intent: Ministerie van VWS (2018); effect on BMI negligible: Eykelenboom et al. (2023)
ZN: Reimburse Combined Lifestyle Intervention (GLI) free of deductible (Zvw, 2019)	GLI participation rate p# participants/year]	+	Striped, black	—	Policy intent: NPA (2018) / Zvw (2019); low participation despite coverage: Eykelenboom et al. (2023); Zorginstituut Nederland (2023)
VNG: Co-fund local health initiatives via GALA (healthy food environment)	Amount of healthy food available [# healthy food outlets/km²]	+	Solid, black	—	GALA (Ministerie van VWS, 2023); Ministerie van VWS (2018)
VNG: Co-fund sport and exercise provision via GALA	Physical activity level [% adults meeting physical activity guideline]	+	Solid, black	—	GALA (Ministerie van VWS, 2023); RIVM (2025): 82% of municipalities report GALA gave extra impulse to sport en bewegen

Fast food restaurants: Market energy-dense products (advertising & promotions)	Consumption of unhealthy food [Kcal/year/person]	+	Solid, blue	—	Ter Ellen et al. (2025); Waterlander et al. (2025): marketing drives demand for unhealthy products
KHN: Lobby against mandatory advertising restrictions and product reformulation requirements	Consumption of unhealthy food [Kcal/year/person]	+	Solid, red	—	Assumption based on RIVM (2024): NPA measures lack enforceability, partly attributable to sector lobby influence
C. Internal factor → Internal factor					
Chronic stress	Consumption of unhealthy food [Kcal/year/person]	+	Solid, blue	R3	Ter Ellen et al. (2025)
Amount of fast food restaurants	Price of unhealthy food [€ per kcal]	–	Solid, blue	R2	Waterlander et al. (2025)
Amount of fast food restaurants	Amount of healthy food available [# healthy food outlets/km²]	–	Solid, blue	—	Waterlander et al. (2025): fast food outlet density crowds out healthy food retail space
Price of unhealthy food	Consumption of unhealthy food [Kcal/year/person]	+	Solid, blue	R2	Waterlander et al. (2025)
Consumption of unhealthy food	Normalisation of unhealthy dietary patterns	+	Solid, blue	R1	Ter Ellen et al. (2025)
Normalisation of unhealthy dietary patterns	Consumption of unhealthy food [Kcal/year/person]	+	Solid, blue	R1	Ter Ellen et al. (2025)
Amount of healthy food available	Consumption of unhealthy food [Kcal/year/person]	–	Solid, blue	—	Waterlander et al. (2025); Hartstichting (2024): more healthy options reduce relative unhealthy consumption
GLI participation rate	Consumption of unhealthy food [Kcal/year/person]	–	Solid, blue	—	Eykelenboom et al. (2023): GLI leads to significant individual-level reduction in unhealthy dietary behaviour
Consumption of unhealthy food	Amount of fast food restaurants [# fast food outlets/km²]	+	Solid, blue	R2	Waterlander et al. (2025); Ter Ellen et al. (2025): sustained consumer demand drives market expansion of fast food outlets

Consumption of unhealthy food	Overweight prevalence (% adult women with overweight/obesity)	+	Solid, blue	—	Eykelenboom et al. (2023); Hartstichting (2024): excess caloric intake is the primary driver of overweight and obesity
Physical activity level [% adults meeting physical activity guideline]	Overweight prevalence (% adult women with overweight/obesity)	–	Solid, blue	—	Eykelenboom et al. (2023): physical activity is a key protective factor against overweight; NPA physical activity guideline (2018)
Overweight prevalence[(% adult women with overweight/obesity]	CVD risk	+	Solid, blue	—	Hartstichting (2024): overweight and obesity are major CVD risk factors, especially in adult women
D. Internal factors → Actor goals (criteria)					
CVD risk	VWS goal: CVD prevalence [# CVD events per 1,000 adult women per year]	+	Solid, red	—	Assumption based on NPA (2018): higher CVD risk drives higher CVD prevalence; VWS aims to minimise this indicator
Consumption of unhealthy food	Fast food goal: Sales revenue (€ per year)	+	Solid, red	—	Assumption based on commercial logic: higher consumption of energy-dense products → higher sales revenue
Consumption of unhealthy food	KHN goal: Sales revenue [€/year]	+	Solid, red	—	Assumption based on commercial logic: high demand for hospitality sector products → higher sector revenue
Overweight prevalence	ZN goal: Healthcare costs attributable to overweight [€/year]	+	Solid, red	—	Assumption based on NPA (2018) and GALA
Amount of healthy food available	VNG goal: Healthy local living environment for residents [% municipalities meeting GALA healthy environment targets]	+	Solid, red	—	Assumption based on NPA (2018) and GALA
Physical activity level	VNG goal: Healthy local living environment for residents [% municipalities meeting	+	Solid, red	—	Assumption based on NPA (2018) and GALA

	GALA healthy environment targets]				
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B2: sub-system diagram 0.2 (Smoking)

Row shading indicates evidential basis: blue rows = scientific/evaluation literature; white rows = policy documents (black arrows); pink rows = assumed relations (red arrows). Striped arrows = intended but not confirmed as effective; dotted arrow = relationship with time-lagged effect.

Table B2.1: Causal relations in sub-system diagram 0.2 (Smoking)

From	To	+/-	Arrow	Feedback loop	Source
A. External factors → Internal factors					
Socioeconomic conditions (SES)	Smoking prevalence [% of adult women who smoke]	-	Solid, blue	R2	Mills et al. (2021): SES adversity drives smoking as coping mechanism for stress and financial strain
Cross-border tobacco availability	Smoking prevalence [% of adult women who smoke]	+	Solid, black	—	Kuijpers et al. (2023), p. 25: 4% of smokers increased cross-border tobacco purchases after the 2020 excise increase
Biological addiction mechanisms (to nicotine)	Nicotine addiction level [% heavily addicted smokers in population]	+	Solid, red	—	Structural biological assumption: nicotine dependence increases addiction level (widely established, not from single thesis source)
B. Means → Internal factors					
EZK: Raise tobacco excise taxes	Price of tobacco products [€ per pack of 20 cigarettes]	+	Solid, black	—	Ministerie van VWS (2018); NPA; fiscal mandate of EZK
VWS: Introduce smoke-free environment legislation (mandatory smoke-free schoolyards, hospitality, public spaces; standardised packaging)	Social norm around smoking [survey score]	-	Solid, black	—	Policy intent: Ministerie van VWS (2018); contributes to denormalisation of smoking: Kuijpers et al. (2023)

VWS: Restrict tobacco sales points (display bans; phasing out vending machines and online sales)	Number of tobacco sales points [#sales points/ 10,000 inhabitants]	–	Solid, black	—	Policy intent: Ministerie van VWS (2018); reducing availability lowers prevalence: Kuijpers et al. (2023)
ZN: Reimburse smoking cessation programmes free of deductible (from 2020)	Smoking cessation support uptake [% of smokers using formal cessation care per year]	+	Striped, black	—	Policy intent: NPA (2018); limited population-level effect despite improved access: Kuijpers et al. (2023)
VNG: Support municipalities in implementing Smoke-free generation programme	Social norm around smoking [survey score]	–	Solid, black	—	Policy intent: Ministerie van VWS (2018); municipalities commit to smoke-free environments
Tobacco industry: Market tobacco products (advertising, packaging, strategic pricing, targeted outreach in vulnerable communities)	Social norm around smoking	+	Solid, blue	—	Wilde (n.d.): industry counter-efforts offset denormalisation effects; Mills et al. (2021): targeted marketing in low-SES communities sustains social norm around smoking
ANR: Run public campaigns for smoke-free population	Social norm around smoking [survey score]	–	Striped, black	—	Policy intent: NPA (2018); supporting role noted, standalone population impact limited: Kuijpers et al. (2023)
C. Internal factor → Internal factor					
Price of tobacco products [€ per pack of 20 cigarettes]	Smoking prevalence [% of adult women who smoke]	–	Solid, blue	—	Kuijpers et al. (2023): most effective NPA measure; 2024 excise increase (+30.7%) → 6.1% adult prevalence reduction, 9.2% for youth; 2020 increase (+18.7%) → 3.7% adult reduction
Number of tobacco sales points [#sales points/ 10,000 inhabitants]	Smoking prevalence [% of adult women who smoke]	+	Solid, blue	—	Kuijpers et al. (2023): restricting tobacco availability in commonly visited locations reduces prevalence
Price of tobacco products [€ per pack of 20 cigarettes]	Financial strain [% of disposable income spent on tobacco]	+	Solid, blue	—	Mills et al. (2021): price increases unintentionally raise financial burden for low-income smokers who cannot quit without structural support
Financial strain [% of disposable income spent on tobacco]	Chronic stress [survey score]	+	Solid, blue	R2	Mills et al. (2021): financial pressure is a primary structural stressor generating psychological stress, particularly in low-SES groups

Chronic stress [survey score]	Smoking prevalence [% of adult women who smoke]	+	Solid, blue	R2	Mills et al. (2021): stress increases likelihood of smoking as a coping mechanism and reduces cessation motivation and success
Smoking prevalence	Financial strain	+	Solid, blue	R2	Mills et al. (2021): smokers in vulnerable groups spend a significant share of income on tobacco
Smoking prevalence	Social norm around smoking	+	Solid, blue	R1	Wilde (n.d.): high smoking prevalence reinforces social acceptability of smoking in communities where it is culturally embedded
Social norm around smoking	Smoking prevalence	+	Solid, blue	R1	Wilde (n.d.): social normalisation lowers initiation threshold and reduces cessation motivation
Nicotine addiction level	Smoking cessation support uptake	–	Solid, blue	—	Mills et al. (2021): higher addiction level creates structural barrier to quit attempts and cessation success, even with formal support
Smoking cessation support uptake	Smoking prevalence	–	Striped, blue	—	Kuijpers et al. (2023): cessation support participation contributes to lower prevalence, but uptake remains very low (7.4–9.3% of smokers); dotted = partially broken corrective pathway
Smoking prevalence	CVD risk	+	Solid, blue	—	Hartstichting (2024): smoking is a primary modifiable CVD risk factor
D. Internal factors → Actor goals					
CVD risk	VWS goal: CVD prevalence [# CVD events per 1,000 adult women per year]	+	Solid, red	—	Assumption based on NPA (2018): higher CVD risk drives higher CVD prevalence; VWS aims to minimise this indicator
CVD risk	EZK goal: CVD prevalence [# CVD events per 1,000 adult women per year]	+	Solid, red	—	Assumption based on NPA (2018): higher CVD risk drives higher CVD prevalence; EZK aims to minimise this indicator
Smoking cessation support uptake [% of smokers using formal cessation care per year]	ZN goal: Low preventable healthcare costs from smoking-related disease [€/year]	+	Solid, red	—	Assumption based on NPA (2018) and GALA

Social norm around smoking [survey score]	VNG goal: Healthy local living environment for residents [% smoke-free public spaces in municipalities]	–	Solid, red	—	Assumption based on NPA (2018) and GALA
Social norm around smoking [survey score]	ANR goal: Smoke-free Netherlands [% smokers]	–	Solid, black	—	Kuijpers et al. (2023)
Smoking prevalence [% of adult women who smoke]	Tobacco industry goal: High tobacco sales revenue [€/year]	+	Solid, red	—	Commercial logic: higher smoking prevalence = higher product sales

B3: System diagram 1.0 women specific

Row shading indicates evidential basis: blue rows = scientific/evaluation literature (blue arrows); grey rows = policy documents / design intent (black arrows); red rows = assumed relations (red arrows). Striped arrows = intended but not confirmed as effective; dotted arrow = relationship with time-lagged effect.

Table B3.1: Causal relations in multi-actor system diagram 1.0

From	To	+/-	Arrow	Feedback loop / pathway	Source
A. External factors → Internal factors					
Socioeconomic conditions (SES)	CVD risk in women [# CVD events per 1,000 adult women per year]	-	Solid, blue	—	Shahid et al. (2024); Wang et al. (2023): low SES independently elevates CVD risk in women through multiple pathways — financial barriers to healthy food, lower physical activity, higher occupational stress, and reduced access to preventive care; also present as external factor in sub-systems 0.1 and 0.2
Socioeconomic conditions (SES)	Chronic stress [survey score]	-	Solid, blue	—	Shahid et al. (2024): socioeconomic adversity is a primary driver of chronic psychosocial stress in women, operating through financial strain, caregiving burden, and precarious employment; analogous to the stress pathway in sub-system 0.2 (smoking)
Socioeconomic conditions (SES)	Women's CVD lifestyle programme uptake [# participants per year]	+	Solid, blue	—	Gaffey et al. (2025); Nho (2017): low SES reduces uptake of lifestyle prevention programmes through financial barriers, time constraints, and lower health literacy; Zvw reimbursement partially mitigates this but does not eliminate it
Hormonal and reproductive biology	CVD risk in women [# CVD events per 1,000 adult women per year]	+	Solid, blue	—	Gulati (2023); Shahid et al. (2024): biological sex-specific factors, including estrogen decline at menopause, PCOS-related hormonal dysregulation, and vascular damage from HDP,

					independently elevate CVD risk in women beyond what is explained by traditional risk factors
Hormonal and reproductive biology	Scientific evidence base on female-specific CVD risk mechanisms [composite index of published clinical evidence and guideline adoption]	+	Solid, blue	—	Gulati (2023); Kiss et al. (2024): the biological sex-specificity of women's CVD risk, including PCOS, HDP-related vascular damage, premature menopause, and estrogen decline, constitutes the scientific basis from which the evidence base on female-specific CVD risk mechanisms grows; greater hormonal complexity drives research output, international guideline development, and pressure on GP training content
B. Means → Internal factors					
LHV: Train GPs on sex-specific CVD risk factors (adverse pregnancy outcomes, PCOS, premature menopause)	GP knowledge of sex-specific CVD risk [survey score]	+	Solid, blue	—	Kiss et al. (2025); Gulati (2023): GP training is an established mechanism for improving clinical knowledge; sex-specific training currently absent from Dutch standard GP education
LHV: Train GPs on sex-specific CVD risk factors	GP workload [average hours per week per GP]	+	Solid, red		Assumption: introducing additional screening protocols and training requirements increases GP workload in a system already characterised by high time pressure (Zorginstituut Nederland, 2023)
GGD + ANR: Deploy sex-specific smoking cessation outreach programme for women (intensive behavioural counselling, minimum 4 sessions in first 4 weeks, + NRT + integrated exercise counselling)	Smoking cessation rate among women [% female smokers achieving abstinence at 6 months]	+	Solid, blue	—	Suh et al. (2023): outreach programmes combining intensive counselling and NRT are effective for women; exercise counselling integrated to address weight gain concerns and mood, both primary cessation barriers for women; programme absent from current Dutch sex-specific prevention offer
ZN: Reimburse women's CVD lifestyle programme (Zvw) for women with PCOS, HDP history, or obese women of childbearing age (BMI ≥30 + infertility / reproductive CVD risk)	Women's CVD lifestyle programme uptake [# participants per year]	+	Solid, black	—	Policy mechanism: Gaffey et al. (2025); Nho (2017): Zvw reimbursement enables uptake; eligibility expanded beyond PCOS/HDP to include obese women of childbearing age, parallel to existing GLI but with sex-specific hormonal and reproductive risk criteria

VNG: Invest in safe physical activity infrastructure (walking/cycling paths, green spaces, safe public sport facilities)	Availability of local exercise facilities and equipment [# accessible exercise facilities per district]	+	Solid, red		Assumption: municipal investment in walking/cycling paths, green spaces, and public sport facilities results in tangible exercise infrastructure; the exercise facilities are the primary mechanism through which VNG investment reaches physical activity levels and affects the municipal health budget
Tobacco industry: Lobbying against expansion of cessation reimbursement	Smoking cessation rate among women [% female smokers achieving abstinence at 6 months]	–	Solid, red		Assumption based on Mills et al. (2021): the tobacco industry has a direct commercial interest in maintaining female smoker populations; expansion of cessation reimbursement under the Zvw would reduce the number of female smokers and thereby threaten market share. Lobbying against such expansion is assumed as a logical behavioural extension of this commercial incentive.
C. Internal factor → Internal factor					
Scientific evidence based on female-specific CVD risk mechanisms	GP knowledge of sex-specific CVD risk [survey score]	+	Solid, blue	—	Kiss et al. (2024); Gulati (2023): a growing clinical evidence based on hormonal and reproductive CVD risk mechanisms creates pressure on GP training content and clinical guidelines; GPs with access to updated evidence-based training materials demonstrate better knowledge of sex-specific risk factors; the evidence base amplifies the effectiveness of LHV's training programme
GP knowledge of sex-specific CVD risk	Sex-specific CVD risk identification [# women newly identified as high-risk per year]	+	Solid, blue	—	Kiss et al. (2024); Kiss et al. (2025): improved GP knowledge reduces clinical inertia and increases identification of sex-specific CVD risk factors; current knowledge gaps are a primary driver of underidentification in Dutch primary care
GP workload	Sex-specific CVD risk identification	–	Solid, red		Assumption: high GP workload limits time available for implementing new screening protocols, counteracting the positive effect of improved knowledge on risk identification

Smoking cessation rate among women	CVD risk in women [# CVD events per 1,000 adult women per year]	–	Solid, blue	—	Suh et al. (2023); Gulati (2023): smoking cessation is one of the most effective modifiable CVD risk reductions available; women face sex-specific cessation barriers (weight gain, mood) that targeted programmes specifically address
Smoking cessation rate among women	Chronic stress [survey score]	–	Solid, red	R1	Assumption: successful cessation disrupts the nicotine withdrawal–relief cycle that sustains chronic stress; within the R1 reinforcing loop, higher cessation rates reduce the physiological and psychological stress burden associated with active nicotine dependence
Chronic stress [survey score]	Smoking cessation rate among women	–	Solid, blue	R1	Yong et al. (2009); Suh et al. (2023): chronic psychosocial stress is a primary barrier to smoking cessation, it triggers relapse, suppresses quit attempts, and reduces the effectiveness of cessation interventions; women disproportionately use smoking as a stress-coping mechanism, making the stress–cessation link particularly pronounced; higher chronic stress directly lowers the likelihood of sustained cessation
Sex-specific CVD risk identification	Women's CVD lifestyle programme uptake	+	Solid, blue	—	Gaffey et al. (2025): identification of high-risk women is the prerequisite for referral and enrolment in structured lifestyle prevention; without identification, eligible women cannot access the programme
Sex-specific CVD risk identification	CVD risk in women [# CVD events per 1,000 adult women per year]	–	Solid, red	—	Assumption: timely identification of sex-specific CVD risk factors enables earlier treatment and risk factor management, reducing CVD incidence; identification alone has limited direct effect, the causal chain runs via referral to the lifestyle programme and GP management, making this an assumed rather than directly evidenced relation
Women's CVD lifestyle programme uptake	CVD risk in women	–	Solid, blue	—	Gaffey et al. (2025); Eykelenboom et al. (2023): structured lifestyle intervention reduces major CVD risk factors including blood pressure, weight,

					and cholesterol; comparable to existing GLI evidence base
Women's CVD lifestyle programme uptake	Physical activity level	+	Solid, blue	—	Gulati (2023); Gaffey et al. (2025): lifestyle programmes include structured physical activity components, directly increasing participants' activity levels
Women's CVD lifestyle programme uptake	Chronic stress [survey score]	–	Solid, red	—	Assumption: lifestyle programmes combining physical activity guidance, nutritional support, and behavioural counselling are expected to reduce chronic psychosocial stress; while plausible, stress reduction is a secondary rather than primary measured outcome of the programme and is not directly demonstrated in the cited literature for the specific women's CVD prevention context
Physical activity level	CVD risk in women	–	Solid, blue	—	Ndejjo et al. (2021); Shahid et al. (2024): higher physical activity reduces multiple CVD risk factors including blood pressure, weight, and metabolic profile; also present in sub-system 0.1 (overweight)
Physical activity level	Chronic stress [survey score]	–	Solid, blue	—	Gulati (2023): regular physical activity is an established mechanism for reducing chronic psychosocial stress, operating through both physiological and psychological pathways
Chronic stress [survey score]	CVD risk in women	+	Solid, blue	—	Shahid et al. (2024); Gulati (2023): chronic psychosocial stress is a recognised sex-specific CVD risk factor in women, operating through autonomic nervous system dysregulation and sustained cortisol elevation; also present in sub-systems 0.1 and 0.2
Availability of local exercise facilities and equipment	Physical activity level [% adults meeting physical activity guideline]	+	Solid, blue	—	Ndejjo et al. (2021); Sallis et al. (2016): accessible exercise infrastructure is a direct determinant of population physical activity levels; provision of safe walking/cycling paths, green spaces, and sport facilities reduces environmental barriers to regular physical activity

Availability of local exercise facilities and equipment	Municipal health budget [€ available for local health prevention]	–	Solid, red	B2	Assumption: procurement, installation, and maintenance of exercise infrastructure requires substantial allocation from limited GALA and municipal prevention funds, reducing available budget for other local health priorities
Municipal health budget	Physical activity level	+	Solid, red	B2	Assumption: available budget is a structural enabler of sustained infrastructure investment; lower budget constrains future investment in exercise facilities and limits growth in population physical activity levels
D. Internal factors → Actor goals					
Sex-specific CVD risk identification	LHV goal: ensure appropriate sex-specific CVD risk identification and timely referral in primary care	+	Solid, red	—	Assumption: higher identification rates of women at elevated CVD risk directly serves LHV's primary care quality goal; more women identified through sex-specific pathways enables appropriate preventive referral and management within primary care
Smoking cessation rate among women	GGD/ANR goal: reduce smoking prevalence among women in the local population	+	Solid, red	—	Assumption: higher cessation rates directly serve GGD's and ANR's population health goal; the outreach programme is specifically designed to achieve sustained abstinence among female smokers as a primary outcome
CVD risk in women	ZN goal: reduce preventable healthcare costs	–	Solid, red	—	Assumption: lower CVD incidence directly reduces hospitalisation, treatment, and chronic disease management costs for health insurers
Women's CVD lifestyle programme uptake	ZN goal: reduce preventable healthcare costs	+	Dotted, red	—	Assumption (time-delayed): short-term programme investment increases healthcare costs; net reduction in preventable CVD costs expected over longer time horizon, parallel to GLI cost-effectiveness logic (Eykelboom et al., 2023); dotted arrow indicates time-lagged effect
Physical activity level	VNG goal 1: healthy and active local living environment	+	Solid, red	—	Assumption: higher population physical activity directly serves VNG's municipal health goal; physical activity also contributes to social cohesion and mental wellbeing

Municipal health budget	VNG goal 2: budgetary sustainability of local health investment	+	Solid, red	—	Assumption: higher available municipal health budget signals budgetary sustainability and enables sustained prevention investment, directly serving VNG's financial management criterion; budget depletion through infrastructure investment creates tension between VNG goal 1 and VNG goal 2
Smoking cessation rate among women	Tobacco industry goal: maintain female smoker market share	—	Solid, red	—	Assumption: higher smoking cessation rates among women directly reduce the tobacco industry's female consumer base; the tobacco industry's lobbying means are specifically directed at preventing the cessation rate improvements that GGD, ANR, and ZN seek to achieve

B4: Sub-system diagram 2.1 (overweight/obesity)

All rows are green = interview-supported relations only (new or validated). Type: New = new element/relation derived from interviews; Type: Validated = previously assumed (red) relation confirmed by interviewee. Existing literature, or policy-grounded relations not repeated here, see Chapter 4.

Table B4.1: Interview-derived updates to sub-system diagram 0.1 (Overweight/obesity)

From	To	+/-	Arrow	Type	Theme(S)	Interview insight
A. New factors and relations						
Social media, algorithmic amplification of unhealthy lifestyle content (external factor)	Normalisation of unhealthy dietary patterns	+	Solid, green	New	T3	"As I also said, social media of course..." - I7 identifies social media as a structural external factor that amplifies exposure to unhealthy food and lifestyle content algorithmically
Actor coordination failure, multi-actor waiting dynamic	GLI participation rate	+	Solid, green	New	T4	The structural feature of the Dutch prevention architecture in which each actor awaits initiation by another operates as an external condition on GLI programme effectiveness; no single actor's means can resolve this dynamic from within the system, as it originates in the institutional design of multi-actor prevention policy. Introduces actor coordination failure as a new external factor with a negative relation to GLI participation rate. "In order for collaboration to happen, everybody is waiting for each other." (I3)
KHN: Lobby against mandatory advertising restrictions and product reformulation	Point-of-sale decision complexity, healthy food options require more cognitive processing	+	Solid, green	New	T3	KHN lobbying keeps the retail food environment complex: more product variety, weaker labelling requirements, and limited reformulation pressure maintain a shelf context in which healthier alternatives are cognitively less legible; I7: "There is always a business model behind it", commercial actor interests structurally preserve the conditions under which point-of-sale decision complexity disadvantages healthy choice

Point-of-sale decision complexity, healthy food options require more cognitive processing	Consumption of unhealthy food	+	Solid, green	New	T1	"If people are looking at a shelf in a supermarket for three seconds, if they don't quickly understand what it is, they won't engage with it" - I6 identifies that healthy food alternatives which are unfamiliar or cognitively complex are bypassed within the ~3-second consumer shelf-decision window; limits the effectiveness of food labelling (Nutri-Score) and healthy food availability interventions that assume processing time; consumers default to familiar unhealthy options when the healthy alternative requires effort
GLI participation rate	Social norms around physical activity	+	Solid, green	New	T6	"You often see women walking in groups... positive peer pressure works" - I2 identifies that programme participation generates peer norm effects: as more women participate in the GLI, group exercise norms strengthen and create a social multiplier on activity level; the GLI participation rate thus has a secondary positive effect on physical activity through the social norm pathway
Social norms around physical activity	Physical activity level	+	Solid, green	New	T6	Social norms around physical activity, built through programme participation (see row above), act as an independent determinant of physical activity beyond infrastructure provision alone; I2: peer dynamics and group exercise norms create a social multiplier effect that sustains activity levels independently of formal programme enrolment
B. Validated assumptions						
Socioeconomic conditions	Chronic stress	-	Solid, green	Validated	T5	I5 confirms that financial insecurity is a direct driver of chronic stress as the mechanism through which SES shapes health behaviour; stress from financial precarity reduces capacity for healthy lifestyle choices and sustains coping behaviours such as unhealthy eating; validates the assumed relation between low socioeconomic conditions and elevated chronic stress in the diagram. "Financial security (bestaanszekerheid) has a huge impact on health." (I5)

KHN: Lobby against mandatory advertising restrictions and product reformulation	Consumption of unhealthy food	+	Solid, green	Validated	T1	"But yes, it still has to be sold. So there is always a business model behind it." I7 confirms that commercial actor interests structurally prioritise revenue over health outcomes;
Physical activity level	Healthy local living environment	+	Solid, green	Validated	T2	I2 validates that achieved physical activity levels among residents are a direct expression of VNG's goal of a healthy local living environment; when built environment design successfully encourages movement, the resulting behaviour change confirms that VNG's means are operating as intended along the full causal chain. "When you design places that invite movement, you actually see people use them, that is what we are working towards." (I2)

B5: Sub-system diagram 2.2 (smoking)

All rows are green = interview-supported relations only (new or validated). Type: New = new element/relation derived from interviews; Type: Validated = previously assumed (red) relation confirmed by interviewee. Existing literature, or policy-grounded relations not repeated here, see Chapter 4.

Table B5.1: Interview-derived updates to sub-system diagram 0.2 (Smoking)

From	To	+/-	Arrow	Type	Interview (s)	Interview insight
A. New factors and relations						
Autonomous behavioural trends, secular decline in smoking independent of policy	Smoking prevalence (among adult women)	+	Solid, green	New	T3	"The decline in smoking prevalence that you observe is largely driven by generational and social change, it would have occurred with or without these policy measures. Whether you can genuinely attribute that reduction to government intervention is a question that deserves much more scrutiny." (I4); policy effectiveness may be systematically overstated by conflating policy-driven change with secular trends
Price of tobacco product	Product substitution, alternative nicotine products / cross-border purchases	+	Solid, green	New	T3	"What have you achieved as a government if people just divert to other products?", I4 identifies a product substitution dynamic as an unintended consequence of tobacco control: rather than quitting, a proportion of smokers substitute to e-cigarettes, or cross-border purchases; partially undercuts the intended corrective pathway from both excise tax (EZK)
Product substitution, alternative nicotine products / cross-border purchases	Smoking prevalence (among adult women)	+	Solid, green	New	T3	Product substitution maintains or raises overall nicotine prevalence: smokers who switch to alternatives rather than quit remain in the prevalence count; I4: the government achieves no public health gain if smokers divert to other products, the smoking prevalence figure is therefore not reduced by tobacco control measures where substitution occurs, undermining the effectiveness of the corrective pathway from excise tax and point-of-sale restrictions

VWS: Exclude tobacco industry from policy process	Tobacco control measure effectiveness	-	Solid, green	New	T2, T3	I4 confirms that VWS structurally excludes the tobacco industry from regulatory design and argues that this exclusion produces less effective tobacco control measures: without product knowledge and consumer behaviour data from the industry, regulation is designed from an incomplete picture and generates unintended consequences such as product substitution; the assumed negative effect on measure effectiveness connects to the existing red arrow toward smoking cessation support uptake. "If you design regulation without understanding how the product actually works, you end up with measures that miss their target entirely." (I4)
B. Validated assumptions						
Social norm around smoking	Smoke Free Netherlands	-	Striped, green	Validated	T6	I5 confirms that the social norm pathway toward the Smoke Free Netherlands goal is real in principle but fails in practice: denormalisation approaches that rely on prescribing behaviour trigger defensiveness rather than change; the arrow is therefore modelled as dotted to reflect policy intent without reliable outcome. "The moment you start pointing your finger and telling people what they should do, they shut down. Behaviour change cannot be imposed from the outside." (I5)
Social norm around smoking	VNG: Healthy local living environment for residents	-	Solid, green	Validated	T6	A declining social norm around smoking contributes to VNG's goal of a healthy local living environment; I5 confirms from municipal practice that communities where smoking is less normalised show broader lifestyle health gains; validates the positive relation between denormalisation of smoking and the local health environment goal.
Smoking prevalence	Tobacco industry: sales revenue	+	Solid, green	Validated	T3	I4 implicitly validates that the tobacco industry's commercial goal is structurally tied to smoking prevalence; the industry's active engagement in policy processes to maintain market access is only rational if prevalence directly serves sales revenue; "We believe that adult, well-informed consumers should be able to purchase, buy, and use tobacco." (I4)

B6: System diagram 2.0 (women specific)

All rows are green = interview-supported relations only (new or validated). Type: New = new element/relation derived from interviews; Type: Validated = previously assumed (red) relation confirmed by interviewee. Existing literature, or policy-grounded relations not repeated here, see Chapter 6.

Table B6.1: Interview-derived updates to sub-system diagram 2.0 (women specific)

From	To	+/-	Arrow	Type	Theme(s)	Interview insight
A. New factors and relations						
Medical research gender bias, lack of female representation in medical research	GP knowledge of sex-specific CVD risk	-	Solid, green	New	T5	"Almost all research is conducted on men and not on women. We primarily do research on men and simply apply it to women. You have an enormous bias that many people are unaware of." (I1), the cardiovascular evidence base is structurally male-biased; this creates a ceiling on LHV's GP training means: even well-designed training is limited by the incompleteness of sex-specific CVD evidence in the literature itself
Perceived safety in public outdoor space, women's subjective sense of security in exercising outdoors	Women's outdoor physical activity	+	Solid, green	New	T5	"Even urban planning impacts how safe women feel." / "Women might not want to stay in the same place to exercise, they keep moving, or they avoid certain areas entirely. Public health and public safety are directly connected." (I2), women's subjective sense of security in outdoor public space operates as a structural external condition on sex-specific physical activity behaviour; safety concerns limit use of outdoor exercise infrastructure regardless of its availability
Women's outdoor physical activity (new internal factor)	Physical activity level	+	Solid, green	New	T5	"When women feel safe in a space, you see them use it differently, they walk further, they stay longer, they come back. That is where the health effect actually accumulates." (I2), women's outdoor physical activity constitutes a meaningful sex-specific component of overall physical activity levels; as the safety condition improves, outdoor activity increases and feeds into the broader physical activity outcome
B. Validated assumptions						

VNG means: Investment in local exercise equipment	Availability of local exercise equipment	+	Solid, green	Validated	T2	I2 confirms that VNG's investment means do translate into actual provision of exercise infrastructure at the local level; the first step of the causal chain from VNG means to physical activity functions as intended, with equipment being made available; the breakdown occurs downstream, not at this stage. "The infrastructure gets built, the equipment is there. That part works." (I2)
Availability of local exercise equipment	Physical activity level	+	Striped, green	Validated	T2	I2 validates that availability of local exercise equipment does not automatically translate into physical activity among women; the assumption that provision equals use is not supported in practice; safety concerns, social norms, and design quality determine whether available infrastructure is actually used, making this a policy intent arrow rather than an operational causal relation. "Just placing equipment somewhere does not mean women will use it. If the space does not feel safe or inviting, it stays empty." (I2)
Tobacco industry: Lobbying against expansion of cessation reimbursement	Smoking cessation rate	-	Striped, green	Validated	T3	I4 confirms that the tobacco industry actively lobbies against expansion of cessation reimbursement but also discloses that it is formally excluded from the policy design process; the assumed negative effect on cessation rate is therefore modelled as dotted to reflect that formal exclusion reduces the directness of this assumed causal relation. "We make no secret of the fact that we would indeed like to be involved in policy, but we are structurally kept outside of those conversations." (I4)
LHV: Train GPs on sex-specific CVD risk factors	GP workload	+	Solid, green	Validated	T2	"GPs know what they should be doing, but the workload simply does not allow for a complete cardiovascular risk assessment on top of everything else. Knowledge is not the bottleneck, capacity is." (I5), validates the B1 balancing pathway: LHV training successfully transfers knowledge, but implementing that knowledge in practice increases GP workload and is structurally constrained by consultation capacity; the dampening effect on CVD risk identification operates through workload, not expertise

Socioeconomic conditions (SES)	Women's CVD lifestyle programme uptake	–	Solid, green	Validated	T5	I5: "Due to chronic conditions or worries about financial security, people face barriers that go far beyond what reimbursement can solve." I2: "You need to design things around people's lives.", low-SES women face compound structural barriers (cost, time, trust, transport) that Zvw reimbursement alone does not resolve; validated by two practitioners from different sectors as a confirmed multidimensional access barrier
Municipal health budget	Physical activity level	+	Solid, green	Validated	T1	"The problem with GALA is that the money stays at the province. By the time it reaches the local level where the actual intervention needs to happen, there is very little left." (I2), budget availability at local level structurally constrains investment in physical activity infrastructure;

Appendix C: Interview design overview

Table C1 shows an overview design based on the checklist from Tong et al. (2007)

Table C1: Overview of interview design (based on Tong et al., 2007)

No	Item	Description	Application to this study
Domain 1: Research team and reflexivity			
1	Interviewer/facilitator	Which author/s conducted the interview or focus group?	The only author of this thesis.
2	Credentials	What were the researcher's credentials? (e.g., PhD, MSc)	MSc student at TU Delft.
3	Occupation	What was their occupation at the time of the study?	MSc student and thesis researcher.
4	Gender	Was the researcher male or female?	Female.
5	Experience and training	What experience or training did the researcher have?	First-time experience conducting academic interviews in a graduate research context. Academic background in policy analysis and public health.
6	Relationship established	Was a relationship established prior to study commencement?	Most participants were not previously known to the researcher. Participants were identified and approached via the researcher's professional network at Rypple, or directly via email. No prior personal relationship existed with any participant before the study commenced.
7	Participant knowledge of the interviewer	What did the participants know about the researcher?	When approached, candidates were given a brief summary of the thesis project, research questions, and objectives. Additional personal motivations were discussed if requested.
8	Interviewer characteristics	What characteristics were reported about the interviewer? (e.g., bias, assumptions, interests)	The researcher approached the interviews from a systems perspective, using a mental model based on the multi-actor system diagram developed in Chapter 5. This model was

			not shared with participants prior to or during the interviews to avoid anchoring their responses.
Domain 2: Study design			
9	Methodological orientation and theory	What methodological orientation was stated to underpin the study?	Thematic analysis (Braun & Clarke, 2006). The approach was selected for its flexibility and suitability for exploring actors' perceptions in contexts where views are partially unknown in advance.
10	Participant selection	How were participants selected?	Purposive sampling: participants were selected based on their organisational role in the Dutch CVD prevention system, as identified in the actor analysis in Chapter 6.
11	Method of approach	How were participants approached?	Participants were primarily identified and approached via the researcher's network at Ryppe, using email. One participant was directly approached by the researcher via email. No social media platforms were used.
12	Sample size	How many participants were in the study?	7 participants. All interviews were conducted individually (one participant and the researcher per interview).
13	Non-participation	How many people refused to participate or dropped out? Reasons?	16 candidates were approached in total. 10 responded: 7 agreed to participate and were interviewed; 3 declined (reasons not specified). 6 candidates did not respond to the initial contact.
14	Setting of data collection	Where was the data collected?	Data was collected via interviews conducted using Microsoft Teams.
15	Presence of non-participants	Was anyone else present besides the participants and researcher?	No. All interviews were conducted individually, with only the researcher and one participant present.

16	Description of sample	What are the important characteristics of the sample?	Participants represented a diverse range of roles and sectors relevant to the Dutch CVD prevention system: national government (VWS policy advisor), healthcare (medical professional), industry (tobacco lobbyist), municipal health programmes (Amsterdam Vitaal & Gezond), civil society (JOGG), the built environment (architect/urban planner), and the private sector (health start-up entrepreneur). Participants operated at national, municipal, clinical, industry, and cross-sectoral levels. Age, gender, and other demographic characteristics were not systematically collected, as they were not relevant to the research questions.
17	Interview guide	Were questions, prompts, or guides provided by the authors? Was it pilot tested?	An semi-structured interview with a topic guide was used. The topic guide was developed based on the conceptual framework and system diagrams in Chapters 5 and 6, and reviewed by the thesis supervisor. The topic guide was not shared with participants in advance; topics were explored conversationally during the interview.
18	Repeat interviews	Were repeat interviews carried out?	No repeat interviews were conducted.
19	Audio/visual recording	Did the research use audio or visual recording?	All interviews were recorded via Microsoft Teams. Auto-transcripts were generated and subsequently reviewed, summarised, and anonymised by the researcher.
20	Field notes	Were field notes made during and/or after the interview?	No structured field notes were taken. The auto-transcripts and researcher summaries served as the primary source of information. Recordings were rewatched where necessary to clarify points of ambiguity.
21	Duration	What was the duration of the interviews?	Interviews ranged from approximately 45 to 90 minutes in duration, depending on the depth of discussion and the participant's availability.

22	Data saturation	Was data saturation discussed?	Partial data saturation was reached. For participants involved in health prevention initiatives (I3, I5, I7), recurring themes emerged by the seventh interview, particularly around the need for cross-actor collaboration and the felt responsibility of actors to transition toward a more preventive health system. However, full saturation was not achieved for the broader actor landscape: perspectives from key system actors identified in Chapter 6, such as general practitioners (LHV), municipalities (VNG), and health insurers (ZN), remain underrepresented. Additional interviews with these actors would have been conducted had time and access allowed.
23	Transcripts returned	Were transcripts returned to participants for comment and/or correction?	Anonymised summaries of each interview were prepared and returned to the respective participants for review. Participants were invited to provide feedback or corrections. Any amendments requested were incorporated prior to the coding and analysis phase.
Domain 3: Analysis and findings			
24	Number of data coders	How many data coders coded the data?	One, the author of this thesis.
25	Description of the coding tree	Did authors provide a description of the coding tree?	A hybrid deductive-inductive coding structure was used. Deductive codes were derived from the topic guide and the multi-actor system diagrams (Chapters 5–7). Inductive codes emerged from the data during line-by-line coding. A full overview of the coding structure is provided in Appendix X.
26	Derivation of themes	Were themes identified in advance or derived from the data?	Hybrid. Deductive themes were pre-specified based on the multi-actor system framework and the topic guide. Inductive themes emerged from line-by-line coding of interview content. Themes were finalised through iterative review across the full data set.

27	Software	What software, if applicable, was used to manage the data?	ATLAS.ti was used for qualitative coding and theme generation.
28	Participant checking	Did participants provide feedback on the findings?	Anonymised interview summaries were returned to participants (see item 23). Participants were not asked to review or validate the thematic analysis findings, as these were derived after the summaries were shared. The final thesis will be distributed to participants who expressed interest in the outcomes.
29	Quotations presented	Were participant quotations presented to illustrate the themes?	Yes. Representative quotes are presented in Section 8.2 to illustrate each theme. Quotes are attributed to anonymous interview reference IDs (e.g., I1, I2).
30	Data and findings consistent	Was there consistency between the data presented and the findings?	Yes. Themes and their definitions were verified against the full set of coded quotes to ensure consistency. Discrepant cases are noted in the analysis.
31	Clarity of major themes	Were major themes clearly presented in the findings?	Yes. See Section 8.2 for the presentation of major themes with supporting quotes and analytical interpretation.
32	Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	Minor themes and deviant cases are noted within the relevant thematic sections where they add analytical depth or qualify the major findings.

Appendix D: Literature overview of women specific CVD prevention interventions

Table D1 presents twelve women-specific policy interventions across three domains: (1) sex-specific CVD risk identification in primary care; (2) direct behavioural prevention targeting smoking and overweight among women; and (3) structural and systemic improvements in coverage and data. For each intervention, the responsible actor(s) and source(s) are indicated.

Table D1: Policy interventions for CVD prevention in women

Policy intervention	Source(s)
Implement structured postpartum cardiovascular surveillance for women with a history of hypertensive disorders of pregnancy (HDP) or preeclampsia, including regular blood pressure and metabolic monitoring in the first year after delivery.	Lee & Lee (2025); Shahid et al. (2024)
Incorporate adverse pregnancy outcomes (HDP, gestational diabetes, preeclampsia) and sex-specific risk factors (premature menopause, PCOS) as risk-enhancing factors in cardiovascular risk assessment guidelines and clinical practice.	Gulati (2023); Shahid et al. (2024); Kiss et al. (2024)
Integrate CVD risk screening into existing reproductive and maternal health contacts (prenatal visits, family planning, postpartum check-ups) to identify at-risk women through established healthcare touchpoints.	Wang et al. (2024)
Provide training for primary care physicians and cardiologists on sex-specific CVD risk profiles, female-typical symptom presentations, and equitable approaches to treatment to reduce clinical inertia in the management of women.	Kiss et al. (2025); Gulati (2023); Kiss et al. (2024)
Systematically screen women diagnosed with polycystic ovary syndrome (PCOS) for elevated CVD risk and offer targeted preventive lifestyle counselling through primary care.	Shahid et al. (2024)
Deploy outreach smoking cessation programmes specifically targeting women through women-dominated workplaces and community settings, providing a minimum of four intensive in-person counselling sessions in the first four weeks combined with nicotine replacement therapy (NRT).	Suh et al. (2023)
Integrate structured exercise counselling into smoking cessation programmes for women to address post-cessation weight gain and mood deterioration, the two primary cessation barriers among female smokers.	Suh et al. (2023)
Develop lifestyle intervention programmes for obese women of childbearing age, combining physical activity, nutritional education, and psychosocial support, with eligibility criteria that incorporate reproductive health	Nho (2017)

markers (PCOS, BMI ≥ 30 combined with infertility) alongside traditional thresholds.	
Invest in safe and accessible physical activity infrastructure (cycling and walking paths, green spaces, sport facilities) as a population-level enabler of physical activity among women, particularly in low-SES urban areas.	Ndejjo et al. (2021); Shahid et al. (2024)
Develop culturally adapted CVD prevention programmes targeted at women from minority and low-socioeconomic backgrounds, incorporating community outreach, multilingual education, and peer-led delivery.	Shahid et al. (2024); Wang et al. (2024)
Mandate sex-disaggregated data collection and public reporting for CVD outcomes, risk factor prevalence, and treatment uptake to provide the evidence base for sex-specific policy targeting.	Gulati (2023); Wang et al. (2024); Gaffey et al. (2025)
Establish formal reimbursement mechanisms for integrated cardio-obstetric care pathways to finance preventive care for women at elevated CVD risk, moving beyond individual risk management toward systemic preventive coverage.	Gaffey et al. (2025)

Appendix E: Framing divergences across interviewees sectors

The following tables (E1 and E2) present, for T1 and T3, how different sectors use the same theme to make structurally different arguments. The analysis operates at the code level: each framing is grounded in specific Atlas.ti codes, allowing the reader to verify the attribution against the full codebook in Appendix D. These framing divergences do not represent errors in the analysis but are themselves substantive findings about the positional interests of actors in the CVD prevention system.

Within T1, Sectors 1 and 3 simultaneously hold framings A and B, acknowledging the structural barrier while also identifying conditional opportunities where economic logic can enable prevention. Framing C is exclusive to Sector 4 (I6) and is absent from policy and public health discourse: the commercial market logic that makes healthy choices structurally inaccessible is framed not as a regulatory problem but as a commercial infrastructure problem.

T3 reveals the most pronounced contradiction in the dataset, and it occurs within a single sector. S4's two interviewees hold structurally opposed understandings of the commercial sector's role: I4 (tobacco industry) positions itself as a victim of policy exclusion, while I6 (health-oriented entrepreneur) confirms from the inside that commercial market logic structurally prevents health-promoting choices. Sectors 1 and 3 agree that commercial systems undermine prevention, but locate the cause in structural incentives and self-interest rather than regulatory failure or market dynamics alone.

Table E1: Framing divergences T1: The system pays for illness instead of health

Framing	Description	Atlas.ti codes	Sector(s)
A: Healthcare system as structural barrier	The curative incentive architecture of the Zvw disincentivises prevention investment; preventing disease is structurally unprofitable within the current reimbursement model	system_incentivised_by_illness_not_health; reimbursement_definition_gatekeeps_prevention_funding; insurer_financial_incentives_determine_prevention_priorities	S1, S3
B: Economic logic as enabler of prevention	Under specific conditions, economic incentives can align with prevention goals, notably where prevention reduces employer absenteeism costs, or where a political reframing from 'care cost' to 'health investment' creates new justification for prevention spending	employer_offers_prevention_to_retain_workforce; policy_framing_shift_from_care_to_health	S1, S3
C: Commercial market logic as structural barrier	Market dynamics and commercial purchasing priorities structurally prevent health-promoting choices, independent of policy incentives; even where healthier alternatives exist, intermediary cost-profit logic overrides them	commercial_business_model_of_unhealthy_products_structurally_undermines_prevention; commercial_intermediaries_prioritise_operational_cost_over_health_when_purchasing	S4

Table E2: Framing divergences within T3: Commercial interests actively undermine prevention

Framing	Description	Atlas.ti codes	Sector(s)
A: Commercial sector as excluded actor	The tobacco industry frames itself as formally excluded from a policy process that would produce better-designed regulation if informed by industry knowledge; policy outcomes are attributed to political rather than evidence-based logic	antagonist_actor_formally_excluded_from_policy_process; industry_data_dismissed_regardless_of_corroborating_evidence; informed_adult_autonomy_as_counterargument_to_prohibition; price_policy_displaces_consumption_without_reducing_smoking_prevalence	S4
B: Market structure as prevention barrier	A health-oriented commercial actor confirms that market logic structurally undermines prevention: intermediaries prioritise cost and margin, consumers resist unfamiliar healthy products, and market entry requires systemic adoption before individual choice becomes viable	commercial_business_model_of_unhealthy_products_structurally_undermines_prevention; commercial_intermediaries_prioritise_operational_cost_over_health_when_purchasing; health_product_market_entry_requires_intermediary_sector_adoption_before_retail; unfamiliar_health_product_fails_without_immediate_legibility_to_consumer	S4
C: Systemic conflict requiring structural response	From health, policy, and prevention perspectives, conflicting logics are not an exclusion problem but a structural incompatibility: commercial, digital, and market systems actively adapt to neutralise health interventions, and voluntary collaboration is insufficient when actor interests are fundamentally misaligned	opposing_systems_adapt_to_neutralise_health_interventions; change_accepted_until_self_interest_threatened; antagonist_actor_framing_contradicts_actual_compliance_record; regulation_as_alternative_mechanism_when_voluntary_collaboration_fails; social_media_as_structural_external_driver_of_sedentary_behaviour	S1, S3

Appendix F: anonymized interview summaries

These anonymised summaries have been prepared to give an overview of the key insights drawn from the interviews. Names, specific job titles, and organisational names that could identify individuals have been omitted or generalised.

F1: Interview 1

Duration: Approximately 1 hour 25 minutes

Interviewee profile: A professional with broad multidisciplinary experience spanning the pharmaceutical industry, healthcare policy, digital health, and patient advocacy

System understanding and framing

The interviewee offered a wide-ranging perspective on why prevention policy in the Netherlands struggles to achieve real-world impact. A central concept introduced was the distinction between "actuality" and "reality": policy is often developed from a filtered, expert-based view of the world (actuality) that diverges substantially from the lived experience of citizens and patients (reality). This mismatch explains why well-intentioned policy documents, including the National Prevention Agreement, do not translate into measurable changes in behaviour or health outcomes.

The interviewee argued that the Dutch healthcare system is organised around "illness profit" (ziektewinst) rather than "health profit" (gezondheidswinst). Actors in the system: hospitals, specialists, and health insurers, are financially incentivised to produce care, not to reduce the need for it. This structural tension means that even actors who explicitly support prevention face internal contradictions when prevention threatens their revenue base. The observation that "everyone wants change, as long as it does not affect them personally" was cited as a defining feature of the system.

Stakeholder dynamics and conflict

The interviewee proposed a four-way typology of stakeholders in relation to change: the Enthusiast (willing but uninformed), the Braker (resistant due to habit), the Wait-and-Seer (passive), and the Saboteur (agreeable in word but obstructive in action). The National Prevention Agreement was characterised as a document that allows stakeholders to sign without committing to concrete change, broad agreement is possible precisely because obligations remain vague.

A recurring observation was that vertical funding structures (where budgets are organised by domain, care, prevention, social support) prevent cross-domain prevention investment. Prevention activities that reduce pressure on healthcare are funded from a different budget than the one that benefits, making it structurally difficult to redirect money from curative to preventive purposes.

Women's CVD and sex-specific considerations

The interviewee also highlighted the role of the pharmaceutical industry and research institutions in generating knowledge that is primarily male-focused, noting that "Evidence-Based Medicine" can function as "Evidence-Biased Medicine" when it extrapolates male-only research to women without acknowledgement of the gap.

They suggested that prevention funding from employers, motivated by labour productivity, represents an underexplored avenue, and raised the question of whether employer-funded prevention schemes account for sex differences in health risk.

Reflections on methodology

The interviewee had personal experience of cardiovascular disease as a patient, which gave their reflections on clinical practice particular grounding. They noted that individual variation within professional groups (e.g., cardiologists trained at different institutions) is substantial and often invisible in policy documents that treat professional groups as homogeneous actors. This is a methodological challenge for system-level analysis.

The interviewee questioned whether the multi-actor system diagram captures the full complexity of individual variation within actor groups, noting that a GP trained in city X may practice very differently from one trained elsewhere. They emphasised the value of combining quantitative data with narrative (patient stories, clinical accounts) to avoid losing systemic insight through aggregation. They recommended treating data as "data-supported" rather than "data-driven", necessary but not sufficient for understanding prevention systems.

F2: Interview 2

Duration: Approximately 45 minutes

Interviewee profile: An urban planner working with an interdisciplinary research group focused on healthy place-making and social-spatial transformation in urban areas

System understanding and framing

This interviewee contributed a perspective from spatial design and urban development, emphasising that public health cannot be separated from the built environment. Their work centres on areas of the city with the lowest health outcomes and the highest social-spatial inequality, demonstrating that health disparities are geographically embedded. The physical environment, the availability of safe green spaces, the design of public areas, the density of retail, directly determines whether residents can engage in health-promoting behaviours such as walking or outdoor exercise.

A core argument was that safety in the built environment is a prerequisite for health. If residents, and women in particular, do not feel safe in public spaces, especially in the evening, their only options for physical activity are indoor. The gradual privatisation of public space and the commodification of the built environment were identified as systemic threats to equitable health infrastructure, as responsibility for public safety becomes diffuse and municipalities lack the capacity to address these issues.

Stakeholder dynamics and conflict

The interviewee described the challenges of urban renewal in socially deprived areas, where gentrification can displace existing communities and erode the social cohesion that contributes to residents' sense of ownership and security. The underrepresentation of women in urban planning and architecture professions was raised as a factor that shapes how cities are designed, with implications for whether the safety and health needs of women are adequately considered in spatial planning.

Interdisciplinary collaboration between spatial planning and public health was described as essential but difficult to establish. Different professional cultures, institutional mandates, and timelines make cross-domain cooperation resource-intensive. The interviewee expressed concern that municipalities often lack the resources and capacity to bridge these domains effectively.

Women's CVD and sex-specific considerations

While not directly addressing cardiovascular disease, the interviewee's work on female participation in public space and the relationship between the built environment and physical activity is directly relevant to CVD risk prevention in women. Safe cycling and walking infrastructure, accessible green spaces, and community sport facilities are not merely conveniences, they are health infrastructure. Women from migrant communities were specifically highlighted as facing additional barriers to accessing health-promoting environments, including restricted mobility, limited vitamin D exposure due to indoor lifestyles, and cultural barriers to using public recreational facilities.

Reflections on methodology

The interviewee endorsed a challenge-based, interdisciplinary research approach, noting that citizen participation in the design process, from the earliest stages, is essential for ensuring that interventions actually serve the intended population. Research that involves citizens only at the end of a project risks producing environments designed around assumptions rather than lived realities.

F3: Interview 3

Duration: Approximately 40 minutes

Interviewee profile: A public health professional with a background in medicine, working on health system strengthening, health equity, and multi-stakeholder collaboration for non-communicable disease prevention

System understanding and framing

The interviewee offered a systems-level perspective on the gap between knowledge and action in health prevention. Their central argument was that the main barrier to improving population health is not technical knowledge, actors broadly understand what needs to be done, but the capacity for effective multi-stakeholder collaboration. Every actor in the system acknowledges that the problem is complex and that collaboration is needed, yet each waits for someone else to initiate it. Individuals with the motivation to make cross-institutional connections exist within organisations, but they are often frustrated by institutional mandates, lack of structural support, and the absence of time and budget for coordination.

A key observation was that new coordination structures created to address collaboration gaps frequently become an additional layer of complexity to navigate, rather than reducing it. The interviewee argued that budgeting processes need to explicitly account for time spent on communication and partnership-building, rather than treating these as free resources.

Stakeholder dynamics and conflict

The food system was used as a primary example of stakeholder conflict. Industry actors, including soft drink and tobacco manufacturers, have commercial interests that are fundamentally misaligned with public health goals, and finding common ground requires identifying narrow windows of shared interest. For the tobacco industry, regulation rather than voluntary collaboration was identified as the appropriate mechanism, given the impossibility of finding genuine common ground when a stakeholder's core product is inherently harmful.

A parallel was drawn between academic research, industry actors, and policy makers: academia produces knowledge in silos and communicates through channels inaccessible to practitioners; policy makers focus on short-term electoral cycles incompatible with the long timescales required for public health impact; and practitioners in clinical and community settings operate with limited time and capacity for prevention. Transdisciplinary capacity, the ability to work across disciplines and sectors, was identified as a critical missing skill set across all these domains.

Women's CVD and sex-specific considerations

The interviewee did not address women's CVD directly, but their observations on health equity are broadly applicable. Social determinants of health, including financial insecurity, food

environment quality, and barriers to accessing preventive care, disproportionately affect vulnerable groups, including many women. Interventions designed without the intended beneficiaries in mind, such as digital health applications developed without user involvement, consistently fail to reach those who need them most. The interviewee mentioned social prescribing as an emerging model that addresses this gap by linking health encounters to community-based preventive activities.

Reflections on methodology

The interviewee cautioned against the risk of becoming stuck in system understanding at the expense of action. System mapping is valuable, but the true leverage lies in identifying which actors need to be at the table and co-creating interventions with them. The complexity of the system should not become a reason for inaction. Continuous, rather than one-off, stakeholder engagement was recommended as the most effective approach, building relationships over time rather than convening single consultations.

F4: Interview 4

Duration: Approximately 45 minutes

Interviewee profile: A representative of a tobacco manufacturers' association

System understanding and framing

This interview provided the perspective of a commercial actor whose interests are in direct tension with the goals of tobacco control policy. The interviewee argued that current Dutch tobacco policy is designed and implemented without input from the industry, resulting in measures that are poorly informed about consumer behaviour and market dynamics. The most significant example cited was the effect of sustained excise duty increases: "rather than reducing smoking prevalence, high domestic prices have driven a large proportion of tobacco consumption to cross-border purchases in neighbouring countries". The interviewee cited research suggesting that well over half of tobacco consumed in the Netherlands is no longer purchased there, which means that tax revenue falls while smoking prevalence remains largely unchanged.

A related claim was that standardised packaging, supermarket sales bans, and other visibility restrictions have not demonstrably accelerated the decline in smoking prevalence beyond what would have occurred as an autonomous trend. The interviewee attributed this "reference decline" (a gradual reduction in smoking prevalence that occurs independently of government intervention) to increasing general awareness of health risks.

Stakeholder dynamics and conflict

The interviewee expressed frustration at being excluded entirely from policy consultations. They argued that industry knowledge of consumer behaviour, product characteristics, and market dynamics could improve the design of tobacco control measures, and that exclusion leads to regulations with technical errors and unintended consequences. They contrasted this exclusion with their voluntary support for measures such as raising the minimum age of sale, which they claimed to have advocated for before it was on the public agenda, and compliance programmes targeting points of sale.

The interviewee's stated position was that tobacco use by informed adult consumers should be permitted, that measures targeting young people and pregnant women are appropriate, and that the industry does not oppose the majority of existing regulations. What they object to, they argued, are measures that are not evidence-based and are driven by "wishful thinking" rather than demonstrated effectiveness.

Women's CVD and sex-specific considerations

The interviewee acknowledged without hesitation that smoking is harmful and that this applies to cardiovascular disease. They specifically raised pregnant women as a priority group where targeted, evidence-based messaging could be more effective than generic campaigns, noting that awareness of tobacco's effects on the unborn child remains surprisingly low among some smokers. They advocated for more targeted interventions focused on specific risk groups (young people, pregnant women) rather than broad, population-level restrictions.

Reflections on methodology

This interview is particularly relevant to the thesis from a stakeholder conflict perspective. It illustrates the dynamic in which a commercial actor frames its position as evidence-based and reasonable, while simultaneously having structural incentives that are misaligned with public health goals. The interview raises the methodological question of how to represent conflicting actor interests in a system diagram, and whether including actors in the diagram implies legitimising their means.

F5: Interview 5

Duration: Approximately 45 minutes

Interviewee profile: A programme director of a large municipal health and prevention network, working to reduce health inequalities in a major Dutch city

System understanding and framing

This interviewee offered a grounded practitioner's perspective on why prevention policy in the Netherlands stalls despite broad consensus on goals. Their central diagnosis was that the healthcare system is organised around care production, not health outcomes. The Health

Insurance Act (Zvw) is written from a curative perspective, which creates perverse incentives: hospitals that invest in prevention reduce their patient volumes and therefore their revenue. A politician cannot "score" by announcing the reduction of a treatment, meaning that politically popular action tends to be on the care side rather than the prevention side. Budget allocations for prevention remain constrained even when coalition agreements include ambitious health language.

The interviewee drew on transition theory (the X-curve model) to explain the dynamics: sustainable change toward a health-oriented system must come from bottom-up initiatives outside the existing structure, which the existing system must then be ready to absorb. The existing system, insurers, hospitals, regulators, is "rumbling" but unlikely to drive the transition itself. The hope lies in neighbourhood-level and community-level initiatives that are already building what is needed, independent of institutional incentives.

Stakeholder dynamics and conflict

The interviewee provided a vivid example of the misalignment between health insurer incentives and prevention goals: a hospital that invested in prevention faced an "empty bank account" because it was no longer generating care production. Conversations between health insurers and municipalities about future funding models are ongoing but structurally difficult, because insurers operate under a legal mandate that does not reward preventive investment. The failure of a publicly prominent initiative, in which a GP referral platform attempted to push digital care changes and ended up in conflict with GPs broadcast in the media, was cited as an example of how attempts to change the system without sufficient co-creation can backfire.

The interviewee noted that actors across the system, insurers, municipalities, GPs, health organisations, hold each other back through institutional caution and regulatory constraint, even when individual actors would like to move faster. The metaphor of a "spaghetti bowl" was used to describe the interconnectedness of the system: every element is linked to every other, making it necessary to choose which "strand" to pull rather than trying to untangle everything at once.

Women's CVD and sex-specific considerations

The interviewee explicitly confirmed that women's health is a significant gap in the current prevention system. Medical research has historically focused on male physiology, and this bias cascades through clinical guidelines and primary care practice. For women with higher education and health literacy, it is already difficult to navigate a system that knows less about the female body; for women with lower education, fewer resources, or language barriers, this difficulty compounds significantly. The interviewee noted that this is reflected in data showing that women report lower health status and experience chronic disease earlier.

Hormonal variation across the life course, reproductive health, pregnancy-related risk factors, menopause, was identified as particularly under-researched, and as a barrier to developing

evidence-based prevention approaches for women. The interviewee noted that female biology's variability makes it difficult to apply traditional research methodologies, which are calibrated for the stable hormone profile of a male subject.

A notable example of a successful community intervention was a women's walking and health programme in a socially deprived area of the city, which combined physical activity, social connection, and low-threshold health conversations. The programme was effective precisely because it was designed around the social and motivational needs of the target group, rather than being structured as a top-down health directive.

Reflections on methodology

The interviewee raised the challenge of individual behaviour as a variable that is difficult to represent in actor-level system models. Building an accessible physical environment is necessary but not sufficient: if an individual lacks the intrinsic motivation or social support to use it, structural improvements alone will not change behaviour. Prevention interventions are most effective when they combine environmental enablement (infrastructure, access, urban design) with social facilitation (community groups, peer support, trusted messengers) and personal relevance (alignment with individual needs and identity).

F6: Interview 6

Duration: Approximately 35 minutes

Interviewee profile: An entrepreneur developing and marketing a botanical, sugar-free infused drink product aimed at the health-conscious consumer market

System understanding and framing

This interview provided a market-level perspective on the gap between consumer health preferences and the purchasing decisions that actually shape food and drink consumption. The interviewee described the process of developing a botanical, sugar-free infused drink product using a family background in herb farming. The product aims to offer an alternative to sugar-sweetened soft drinks by using botanical sweetness which, unlike refined sugar, does not impact blood sugar levels, combined with the sensory experience (flavour, carbonation) that makes conventional soft drinks appealing.

A central observation was that achieving product-market fit for a health-oriented product takes significantly longer than for conventional products, and that the pathway from concept to successful market entry is non-linear. The interviewee described a deliberate choice to target food service settings (cafes, office catering) rather than retail, as the discovery environment and margin structure are more favourable for an unfamiliar product.

Stakeholder dynamics and conflict

The most substantive insight from this interview was the ordering of priorities among commercial food service buyers. Health is not the primary consideration when purchasing a product for a cafe or catering operation: ease of operation (staff time required) comes first, followed by margins, and then health and taste. This hierarchy means that a health-positioned product must first solve operational and financial constraints before its health credentials become relevant to the buyer.

The interviewee also highlighted widespread consumer confusion around sugar labelling: many consumers conflate "no added sugar" with "sugar-free," not recognising that natural sources (such as fruit juice) may contain substantial sugar. This knowledge gap limits the effectiveness of health claims.

Women's CVD and sex-specific considerations

This interview did not directly address women's CVD or sex-specific health risk factors. However, it illuminates a structural barrier relevant to the broader prevention agenda: even when consumers express a preference for healthier options, commercial constraints on the supply side, including operational complexity, margins, and product discoverability, can prevent health-oriented products from reaching them. Changing what people drink and eat requires not only demand-side behaviour change but also changes to the supply-side incentives and infrastructure that shape what is available, affordable, and easily accessible.

Reflections on methodology

This interview reinforces the argument that individual behaviour change cannot be understood independently of the commercial and environmental context in which choices are made. A person who wants to reduce their sugar intake may not find a viable low-sugar option at a price point they can afford, in a format they recognise and trust, in the places where they shop. Prevention policy that targets individual behaviour without addressing these commercial and environmental determinants is unlikely to be fully effective.

F7: Interview 7

Duration: Approximately 50 minutes

Interviewee profile: A policy and expertise manager at a national foundation working on healthy living environments for children and young people, advising municipalities across the Netherlands

System understanding and framing

The interviewee offered a comprehensive view of the challenges of creating lasting change toward a healthier society, drawing on extensive experience working with municipalities across

the Netherlands on healthy living environments for children and adolescents. Their organisation focuses on the themes of nutrition, physical activity, and mental health/relaxation, and works both by advising municipalities and by engaging directly with environments where young people spend time: schools, sports clubs, community centres, media, and public spaces.

A central insight was that small, isolated initiatives, however well-designed, do not add up to a systemic transition. Sustaining and scaling change requires a cultural shift in how society values health, reflected in laws and regulations, market dynamics, and institutional collaboration. The analogy used was the historical trajectory of tobacco control: what now seems like obvious policy took fifty years to achieve through sustained activism, awareness-building, and eventually regulatory change. Overweight and unhealthy food environments are at an earlier stage of this same transition.

The interviewee used the transition model to describe the current moment: after a long period of inertia, there is growing awareness and a proliferation of pilots and small initiatives (the current phase), but what is still missing is the market force and regulatory framework that would move the system to a new equilibrium. The National Prevention Agreement was seen as a step, but insufficient awareness is not the bottleneck; market mechanisms and hard regulation are.

Stakeholder dynamics and conflict

The interviewee highlighted the central challenge of working across municipal variation: each of the 260+ municipalities the organisation supports has its own political landscape, local capacity, budget constraints, and community context. Whether a healthy living initiative succeeds depends on factors including local politics (the values of the ruling coalition), the culture of cross-domain collaboration within the municipality (between spatial planning and public health, for instance), and whether local professionals feel personally responsible for health outcomes.

Commercial actors were identified as a structural external challenge: the profitability of unhealthy products creates a powerful counterforce to health promotion efforts. The interviewee described ongoing but limited-scale dialogues with supermarkets about promoting healthier product choices, noting that willingness exists but urgency, from both commercial actors and government, is insufficient to drive large-scale change. Social media was also named as a systemic external factor, influencing young people's physical activity levels and mental health in ways that are difficult to counteract through local interventions.

Women's CVD and sex-specific considerations

The organisation's primary focus is children and young people rather than adult women, but several observations are directly relevant to the thesis. First, the interviewee confirmed that whether someone grows up in a health-promoting environment strongly determines their adult health trajectory, prevention in childhood and adolescence is the most effective long-term CVD risk reduction strategy. Second, the importance of cultural sensitivity in health promotion was raised: food culture runs deep, and health interventions that do not account for cultural context

are unlikely to reach diverse communities. Third, the challenge of achieving cross-domain collaboration between spatial planning and health at the municipal level, which the interviewee described as still very difficult, is directly relevant to interventions like physical activity infrastructure investment by municipalities.

Reflections on methodology

The interviewee introduced two analytical frameworks that may be relevant to the thesis: the C4 model, which maps the factors determining whether an intervention succeeds at the individual, organisational, and societal-cultural levels; and the transition model, which identifies the phases of systemic change and the types of instruments needed at each phase. These frameworks complement the multi-actor system diagram approach by helping to explain why the same intervention succeeds in one municipality and fails in another.

System-level analysis captures actors and structural relations, but individual variation, how motivated and responsible a specific person within an organisation feels, remains a significant and hard-to-represent factor.

Appendix G: Full codebook interviews

This appendix lists all 70 Atlas.ti codes generated across the seven interviews, organized by their primary theme group. Codes appearing in more than one theme are noted in the 'Theme(s)' column. Row shading reflects the primary theme assignment. Codes prefixed M1 belong to the methodological reflection group and are not counted in the six thematic totals.

Table G1: Full codebook for thematic analysis

#	Code	Theme(s)
M1 - Methodological reflection		
1	interview bias from respondent worldview	M1
2	intra group variation undermines actor homogeneity assumption	M1; T2
3	opposing systems adapt to neutralise health interventions	M1; T3
4	siloed actor focus prevents systemic health problem solving	M1; T4
5	stakeholder typology change attitude	M1; T4
6	system complexity creates analysis paralysis	M1; T4
7	system complexity prevents straightforward prevention policy	M1; T4
T1 - Economic logic drives and limits prevention		
8	commercial business model of unhealthy products structurally undermines prevention	T1; T3
9	commercial intermediaries prioritise operational cost over health when purchasing	T1; T3
10	employer offers prevention to retain workforce	T1
11	insurer financial incentives determine prevention priorities	T1
12	policy framing shift from care to health	T1
13	reimbursement definition gatekeeps prevention funding	T1
14	system incentivised by illness not health	T1
T2 - Policy is designed from a filtered reality		
15	built environment quality directly reduces downstream healthcare burden	T2
16	care supply driven by convenience not evidence	T2
17	data supported not data driven care	T2
18	health labelling misleads consumers and obscures true nutritional content	T2
19	individual behaviour framing obscures structural barriers to health	T2
20	patient centrality claimed but not practiced	T2

21	policy effectiveness overstated by conflating with autonomous trend	T2
22	policy outcome dependent on individual policymaker	T2
23	policy solutions designed for filtered reality not lived experience	T2
24	prevention agreement symbolic commitment	T2
25	prevention measures too generic to reach high risk subgroups	T2
26	regulation designed without product knowledge creates implementation failures	T2
27	regulatory stacking without effectiveness evaluation	T2
28	residential postcode as structural determinant of health inequality	T2
29	short term political cycles prevent long term prevention investment	T2
T3 - Conflicting system logics undermine prevention		
30	antagonist actor formally excluded from policy process	T3
31	antagonist actor framing contradicts actual compliance record	T3
32	change accepted until self interest threatened	T3
33	health product market entry requires intermediary sector adoption before retail	T3
34	industry data dismissed regardless of corroborating evidence	T3
35	informed adult autonomy as counterargument to prohibition	T3
36	price policy displaces consumption without reducing smoking prevalence	T3
37	regulation as alternative mechanism when voluntary collaboration fails	T3; T4
38	social media as structural external driver of sedentary behaviour	T3
39	unfamiliar health product fails without immediate legibility to consumer	T3
T4 - Fragmented responsibility blocks systemic change		
40	collaboration skills systematically defunded despite being essential	T4
41	coordination structures become bureaucratic overhead rather than enablers	T4
42	diffuse responsibility for health outcome in ecosystem	T4
43	GP gatekeeper prevention	T4
44	gp time constraints reduce prevention to tokenistic advice	T4

45	isolated health initiatives fail without systemic transition context	T4
46	municipal peer collaboration as lever for national policy change	T4; T6
47	municipality lacks capacity for health intervention	T4
48	nurses underutilised despite most patient contact	T4
49	regulatory fragmentation prevents coherent public space health infrastructure	T4
50	stakeholder analysis prerequisite for effective prevention design	T4
51	superficial built environment investment fails to sustain behaviour change	T4; T6
52	vertical funding prevents cross domain prevention	T4
T5 - Women's health needs systematically overlooked across domains		
53	bias in medicine	T5
54	built environment designed for individual use ignores female social movement patterns	T5
55	chronic stress from financial insecurity limits health behaviour capacity	T5
56	hormonal variability requires new research methodologies for female CVD	T5
57	medical research male default applied to women	T5
58	migrant women face compounded barriers to healthy behaviour	T5
59	outdoor activity as fundamental CVD prevention behaviour	T5
60	safety in public space prerequisite for physical activity	T5
61	spatial planning without social lens creates unhealthy environments	T5
62	women feel unsafe in public space at night	T5
T6 - Systemic change requires genuine participation and bottom-up transition		
63	behaviour change requires mindset shift	T6
64	citizen involvement tokenistic not co design	T6
65	citizen participation in design improves health outcomes	T6
66	gentrification erodes community ownership and social cohesion	T6
67	habit replacement more effective than prohibition	T6
68	informal ecosystem actors as prevention opportunity	T6

69	knowledge of built environment health link not translated into quality public space	T6
70	repeated tokenistic engagement causes citizen withdrawal	T6

Appendix H: Reflections on multi-actor system diagram as a method

H1: Reflection on system diagram 0.0

The initial multi-actor system diagram (version 0.0) makes explicit how prevention is designed in national policy. However, applying this method at a high level of aggregation also reveals important limitations.

At this level, the system diagram primarily reflects the *intended* functioning of policy rather than its actual effects in practice. Policy documents describe how interventions are expected to influence behaviour and health outcomes, but these intended relationships do not necessarily translate into effective change. As a result, the diagram risks representing an idealised version of the system, in which policy measures appear coherent and aligned, while underlying implementation challenges and limited effectiveness remain obscured.

To make this distinction explicit, a differentiation is introduced between relationships that are supported by evidence and those that represent intended or assumed effects. In the latter case, these relationships are indicated as proposed connections, for example through the use of dotted and coloured arrows in the system diagram. This allows the analysis to reflect not only how the system is designed, but also where gaps may exist between policy intentions and real-world outcomes.

Furthermore, the high level of aggregation limits the ability to capture system dynamics, such as feedback loops. These dynamics are particularly relevant for behavioural risk factors, where interactions between individuals, environments, and policy interventions are complex and often non-linear. As a result, the initial system diagram does not sufficiently reveal the mechanisms through which prevention outcomes are produced.

To address these limitations, the scope of the analysis is narrowed in the remainder of this chapter to focus on overweight/obesity and smoking as key risk factors for CVD among women (Hartstichting, n.d.-a). For each of these two risk factors, current policy measures are evaluated and a more detailed sub-system diagram is constructed, incorporating feedback loops grounded in system dynamics literature to improve the reliability and explanatory depth of the analysis.

H2: Reflection on sub-system diagrams 0.1 and 0.2

Splitting the cardiovascular disease (CVD) prevention system into smaller sub-systems proved useful for gaining a more detailed understanding of the underlying structures and interactions within the system. By focusing separately on key risk factors such as smoking and obesity, it became easier to identify important causal relationships and feedback mechanisms that are difficult to capture in a single high-level diagram. Furthermore, basing these relationships on findings from scientific literature increases the reliability of the diagrams, as the identified interactions are supported by empirical evidence rather than solely by researcher assumptions.

The use of different arrow colours and line types also contributed to the transparency of the modelling process. Distinguishing between relationships derived from scientific literature, policy documents, and other sources makes it easier to assess the evidence underlying each connection. Similarly, the use of solid and dotted lines provides a clear visual indication of the origin and strength of the represented relationships.

Despite these advantages, several limitations remain. Even after dividing the system into sub-systems, the diagrams still contain a large number of actors and relationships. As a result, modelling choices regarding which actors, variables, and interactions to include or exclude are unavoidable. These choices may introduce researcher bias and influence how the system is ultimately represented.

In addition, the diagrams were developed to represent the current organisation of CVD prevention policy. However, it remains challenging to distinguish between how the system is formally organised and how it functions in practice. Policy documents often describe intended structures, responsibilities, and interventions, which may unintentionally result in a representation that reflects an “idealised” version of the system. For example, many measures included in the National Prevention Agreement (NPA) are represented as active relationships within the system because they have been formally implemented. While the RIVM has demonstrated that these measures contributed to reductions in smoking prevalence, many individual interventions show only limited effects and the overall NPA targets are not expected to be achieved. Consequently, the presence of a relationship in the system diagram does not necessarily imply that it is sufficiently effective to achieve the desired policy outcomes.

A further limitation is that the diagrams remain largely dependent on information contained in policy documents and scientific literature. Although these sources provide valuable insights into formal structures and evidence-based relationships, they offer limited understanding of the practical challenges, informal interactions, and implementation barriers experienced by actors in the field. Apart from clearly identifiable conflicting actors, such as the tobacco industry and commercial food actors, it remains difficult to identify the underlying tensions and bottlenecks within the system solely through document analysis.

For this reason, the current sub-diagrams should be regarded as an initial representation of the system rather than a complete depiction of reality. Additional insights from stakeholders are needed to validate, refine, and challenge the assumptions embedded in the diagrams. Interviews with actors involved in CVD prevention can provide a better understanding of how the system operates in practice, which challenges are encountered during implementation, and which factors are insufficiently captured in policy documents and scientific literature. These actor perspectives therefore form an essential next step in improving the reliability and practical relevance of the multi-actor system diagram.

H3: Reflection on system diagram 1.0

System diagram 1.0 demonstrates that a multi-actor system diagram is a useful tool for integrating policy interventions identified in the scientific literature into a broader systems perspective. By explicitly linking interventions to the actors that are most likely to implement them, the diagram provides insight into how individual actions may influence not only the system itself, but also the objectives and interactions of other actors. Rather than viewing interventions as isolated measures, the diagram highlights their interconnected nature within the broader CVD prevention system.

At the same time, this phase revealed several methodological challenges. Compared with the current-state diagrams (version 0.1 and 0.2), the hypothetical nature of system diagram 1.0 requires substantially more interpretation by the researcher. Because the identified interventions have not yet been formally embedded in Dutch policy, there is no official allocation of responsibilities or implementation pathways. Consequently, assumptions had to be made regarding which actors would be responsible for implementing specific interventions and how these interventions would influence other components of the system. These modelling choices inevitably introduce researcher bias and reduce the objectivity of the resulting diagram.

Another limitation concerns the scope of the system. CVD prevention for women spans multiple policy domains, including healthcare, public health, education, the food environment, urban planning, and tobacco control. Attempting to incorporate all these domains into a single diagram results in a highly complex representation in which important system boundaries inevitably remain outside the model. Although a single integrated diagram provides a useful first hypothetical overview, it cannot fully capture the complexity of the underlying subsystems or the interactions between them.

Furthermore, the high-level nature of the diagram makes it difficult to identify feedback loops explicitly. While scientific literature supports many of the proposed interventions, the relationships between interventions and system variables often remain too aggregated to visualise reinforcing or balancing feedback structures. As a result, the diagram primarily illustrates potential pathways for system change rather than the dynamic behaviour of the system.

Finally, because system diagram 1.0 represents hypothetical interventions rather than existing policy, it is not possible to distinguish between intended relationships and interventions that have proven ineffective in practice. In the current-state diagrams, such distinctions could be informed by policy evaluations, such as the RIVM assessment of the National Prevention Agreement. For proposed interventions, however, empirical evidence on implementation within the Dutch context is often unavailable. Consequently, the diagram tends to present a more idealised representation of the system, reducing its reliability as a representation of real-world policy practice.

These limitations underline the importance of incorporating stakeholder perspectives in the next phase of the research. Interviews with actors involved in CVD prevention provide an opportunity to validate the proposed actor-intervention links, challenge researcher assumptions, identify implementation barriers, and refine the system diagram based on practical experience. In this way, stakeholder perspectives contribute to transforming the hypothetical model into a more realistic representation of the Dutch CVD prevention system.

H4: Reflection on system Diagrams 2.0, 2.1 and 2.2

The incorporation of stakeholder interviews substantially improved the understanding of the Dutch CVD prevention system and strengthened the reliability of the multi-actor system diagrams. Whereas the previous versions were primarily based on policy documents and scientific literature, the interviews provided insights into how the system operates in practice. They allowed existing assumptions to be validated, challenged several relationships identified in earlier versions, and revealed new actors, system factors, and interactions that had not emerged from the document analysis alone. As a result, the updated diagrams provide a more realistic representation of the practical functioning of the CVD prevention system.

The interviews also demonstrated the added value of combining documentary evidence with practitioner knowledge. Several interviewees described implementation challenges, informal relationships, and practical barriers that are largely absent from policy documents. These insights helped explain why certain policy measures are less effective in practice than expected based on their formal design. In this way, the interviews not only updated the system diagrams but also increased confidence that the represented relationships better reflect the real-world policy context.

At the same time, the interviews highlighted several limitations of using a multi-actor system diagram for analysing complex health policy problems. Many of the identified challenges proved difficult to represent graphically. For example, interviewees frequently referred to a lack of ownership for prevention, insufficient collaboration between organisations, and the exclusion of certain stakeholders, such as the tobacco industry, from policy-making processes. Although these governance issues strongly influence the functioning of the system, they are difficult to capture using simple causal relationships between actors and system variables.

Another important finding concerns the heterogeneity within actors. The diagrams represent organisations such as the Ministry of Health (VWS), the Association of Dutch Municipalities (VNG), or municipalities as single actors. However, interviewees emphasised that perspectives on prevention often differ considerably within organisations. Similarly, municipalities vary substantially in the way they prioritise, organise, and implement prevention policies depending on local priorities, available resources, and political choices. Representing these diverse perspectives as a single actor inevitably simplifies reality and reduces the ability of the model to capture internal variation.

Finally, several interviewees stressed that the effectiveness of prevention policies ultimately depends on individual behaviour. Whether citizens participate in smoking cessation programmes, adopt healthier lifestyles, or engage with preventive healthcare differs considerably between individuals and is influenced by personal motivation, socioeconomic circumstances, health literacy, and social environment. These behavioural differences are difficult to represent through a single causal relationship in a system diagram, even though they strongly determine the ultimate impact of policy interventions.

Overall, the interview phase demonstrated that stakeholder perspectives considerably enhance the validity of a multi-actor system diagram by providing practical knowledge that cannot be obtained from policy documents or scientific literature alone. At the same time, the findings illustrate that certain governance processes, behavioural mechanisms, and organisational differences cannot easily be represented within a static systems model. Consequently, a multi-actor system diagram should not be interpreted as a complete representation of reality, but rather as a structured simplification that supports system understanding, facilitates discussion among stakeholders, and makes assumptions explicit. The value of the method therefore lies not only in the final diagram itself, but also in the iterative process of updating and validating the model through multiple sources of evidence.

Appendix I: AI logbook

The table below provides an overview of the types of prompts used during the writing of this master's thesis, and their application per chapter. Throughout the entire thesis, AI was used to improve language, academic tone, and formulation, and to translate Dutch draft texts into academic English. In addition, AI was occasionally used as a source of inspiration, to brainstorm structural approaches or explore how to connect findings. All analytical choices, interpretations, diagram constructions, thematic analyses, and conclusions were made independently.

Table I1: AI logbook

Prompt (type / description)	Application in the thesis
General: used throughout the entire thesis	
"Can you check this paragraph for grammar, academic tone, and consistency?"	Language and spelling checks across all chapters; improving English formulations, academic register, and consistency of terminology.
"Please translate this Dutch draft text into academic English and improve the phrasing."	Translation of Dutch concept notes and drafts into the English thesis text; refining formulations based on own Dutch writing and notes.
"Does the argument in this section flow logically? What might I be missing?"	Checking the coherence of the argumentation and identifying gaps in reasoning; used as a sounding board before finalising sections.
"Can you give me some inspiration for how I could approach this section?"	Brainstorming structural and argumentative approaches where I was unsure how to proceed; the actual content and choices were made independently.
Chapter 1: Introduction	
"I am writing an introduction on CVD prevention for women in the Netherlands. What are the key elements a policy analysis introduction should cover?"	Inspiration for structuring the introduction and research questions; understanding expected components of a policy analysis thesis introduction. Final formulation was my own.
Chapter 2: Literature Review	
"Can you summarise the main findings of this article on [topic] and suggest how it might connect to my research focus?"	Support in processing and connecting scientific literature; identifying links between sources. All literature was read and interpreted independently.
Chapter 3: Research Design	
"I am using the multi-actor system diagram method by Enserink et al. (2022). Can you explain the main steps and how I could apply it to a CVD prevention context?"	Understanding and describing the methodology; inspiration for justifying the semi-structured interview design and the hybrid deductive-inductive coding approach.
Chapter 4: Policy Context	
"What are the main characteristics of the Dutch health prevention system and which policy frameworks are most relevant for cardiovascular disease prevention?"	Background information for the policy context chapter; inspiration for structuring the description of the NPA, IZA, GALA, and AZWA frameworks and their interrelations.
Chapter 5: Actor Analysis	

"I have identified these actors in the Dutch CVD prevention system. Can you help me think of a logical structure for describing their roles, mandates, and means?"	Inspiration for organising the actor analysis; support in formulating actor profiles consistently. All mandate analyses and diagram assignments were developed independently.
Chapter 6: Women-Specific Interventions	
"Based on these literature summaries, which interventions seem most applicable given the actor mandates I identified? How could I link them to existing Dutch policy instruments?"	Inspiration for connecting evidence-based interventions to existing actor mandates; support in explaining the translation from international evidence to the Dutch context.
Chapter 7: Actor Perspectives	
"The names of my interview themes feel too generic. Can you suggest more specific titles based on these interview quotes and Atlas.ti codes?"	Inspiration for more specific and analytically grounded theme titles; support in improving the Sankey diagram introduction. The thematic analysis was conducted independently in Atlas.ti.
Chapter 8: Discussion	
"This method reflection section feels too long and unstructured. Can you suggest subheadings to break it up into clearer parts?"	Structural inspiration for the method reflection (§8.1); support in reducing overlap between §8.1 and §8.2 following supervisor feedback.
Chapter 9: Conclusion	
"I want to write practical policy recommendations grounded in my system analysis. What mechanisms could make non-health actors more accountable for CVD prevention for women, without requiring new legislation?"	Inspiration for the practical recommendations in §9.3; support in formulating the answer to the main research question and connecting system analysis findings to concrete, mandate-based policy actions.