# A solid start for the Dutch first thousand days-approach: insights into program adoption, monitoring and cross-sectoral collaboration

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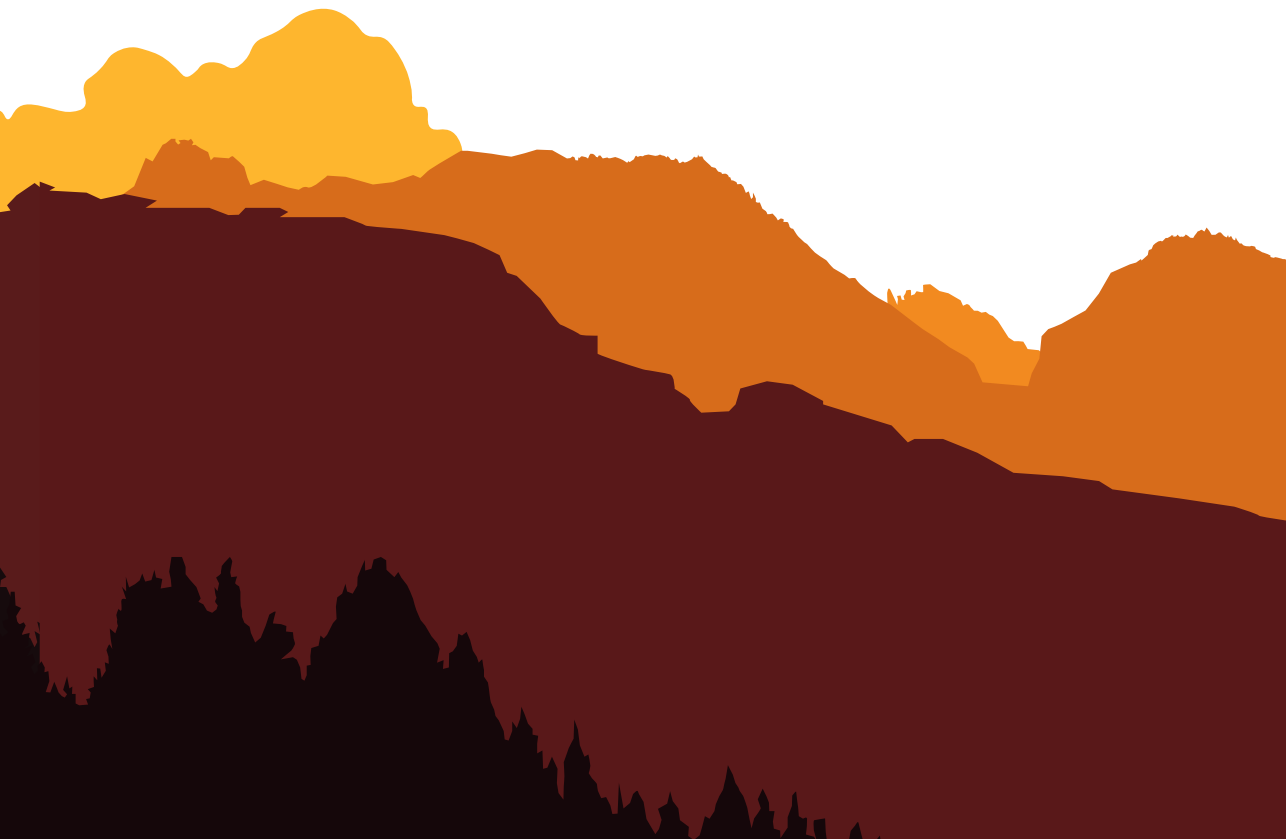
# General introduction



**Importance of the first thousand days of life**

The period from conception to a child's second birthday (i.e. the first thousand days of life) is crucial to children's further physical, mental and social development (1-3). During these first thousand days, the foundations for optimal later health and wellbeing are established (3, 4). The body grows, the immune system develops and all vital organs are formed. The pace of development far exceeds that of any other phase in life. Moreover, it is the period in which our developmental plasticity, the ability to adapt to environmental factors and exposures, is highest (5, 6). Although our experiences across the lifespan can still influence our development to some extent, the first thousand days form the basis for who we are and have lifelong effects (7, 8).

The well-studied Developmental Origins of Health and Disease concept (originally the 'Barker hypothesis') explains how early life experiences and exposures - both positive and negative - can influence later health and wellbeing (9, 10). There is an abundance of studies that show that many (chronic) health conditions such as diabetes, asthma, obesity, cardiovascular diseases, cancer and depression can trace their origins to early life (e.g. 11-18). This was demonstrated for instance by the findings of the Dutch Famine Birth Cohort study in which also timing of exposure appeared important (12, 19, 20). One of the described mechanisms of how early life exposures influence later health and wellbeing is through epigenetic programming. Epigenetic programming states that during critical times of development several factors can 'program' the bodily structures and functions to anticipate the environment it will face in the future (9, 10). Negative factors such as smoking during pregnancy, stress, pollutants and malnutrition can thereby lead to more susceptibility to diseases (21). For example, if a foetus is exposed to poor nutrition, it may adapt its metabolic system by storing more fat, which would be beneficial in case of food scarcity in adulthood, but can lead to obesity and other chronic diseases in an environment with abundant food (9, 10). These epigenetic changes can also be passed down from parents or grandparents to their offspring (8, 10).

A better physical, mental, and social development during early life can lead to various positive outcomes in the future for both the individual as well as society, and thus should be at the centre of investments (22, 23). Some of those positive outcomes include improved learning and behaviour, enhanced educational opportunities, better job prospects, more productivity and greater participation in the workforce or society later in life (8). The Nobel prize-winning economist James Heckman showed that the best return on investment that society can achieve is by focusing its efforts on these first few years (24, 25). Investing early means that the benefits can be enjoyed for longer, and have a compounding effect. These benefits result from both higher revenues as well as savings in costs related to social welfare, poverty, crime and negative health outcomes. Moreover, early interventions are generally less costly compared to later remedial programs (24). Hence, early life investments are the most efficient and effective public investments.

**From a biomedical perspective to a focus on the social determinants of health**

A wealth of research has indicated that our health and opportunities are not solely determined by our genetic, biological or medical characteristics, but rather depend on the direct and indirect impacts of social, economic, cultural and environmental conditions. These conditions in which people are born, grow, live, work, and age are called the Social Determinants of Health (SDOH) (26). Several studies have also proved the importance of (clustered) SDOH for outcomes during pregnancy or childbirth, being focused on factors such as area deprivation or socio-economic status with underlying concepts such as income, occupation and education (27-37). The SDOH framework provides an overview of the structural elements that shape the SDOH, their interrelatedness and the mechanisms by which social determinants generate health inequities (26). Although the medical sector also faces the consequences of unfavourable SDOH, many of the underlying elements and possible solutions fall outside their scope, posing a challenge to reduce health inequities within the medical sector alone (8).



The SDOH can have an impact at various stages of our lives: during the first thousand days, childhood, adolescence and adulthood. According to models of life course health development, our health development is a dynamic, complex and non-linear process that results from different exposures over the life course (7, 38, 39). Both negative (e.g. food or housing insecurity) and positive (e.g. positive school environment) contexts and experiences can lead to different health trajectories (8, 38). The life course theory emphasizes that health differences mainly result from exposures during critical periods in early development, which subsequently accumulate throughout the course of one's life.

The National Academies of Sciences, Engineering, and Medicine (NASEM) used the above insights in their report 'Vibrant and Healthy Kids: Aligning Science, Practice, and Policy to Advance Health Equity' (8). Their conceptual model shows various elements that shape children's health and development during the life course, from conception into adulthood (Figure 1). The development and health of children is presented in the inner purple circle. In the direct environment of children are the factors that directly influence their daily experiences and patterns, such as family cohesion, caregiver well-being and nurturing (dark pink circle). These factors are shaped by the SDOH (pink circle). These SDOH, in turn, are influenced by the outer level: the socioeconomic and political drivers such as policies and laws that distribute resources and opportunities among the population (grey circle). The distribution of resources and opportunities is often disproportionate, based on characteristics such as race, gender or social class. The model provides opportunities for interventions to enhance individual and population health, as well as health equity, from micro to macro levels. Moreover, the model provides a powerful call for practice and policy to prioritize investments in improving preconception and perinatal health, since early life experiences can shape health and well-being across an entire lifetime for parents themselves, but these risks and protective factors can also be transmitted to their children. As these children grow into adulthood and potentially become parents themselves, this can lead to new cycles of inequity or resilience. Because of the intergenerational aspect,

(future) parents or caregivers are a central focus in optimizing children's health and well-being and reducing health inequities (8, 40).

Early life health inequities are known as unjust, unnecessary and preventable differences in health between different (social) groups (41). This can be related to, for example, income, ethnicity, immigration status, education, living circumstances, gender or sexual orientation. The concept of health inequities is frequently used interchangeably with health disparities. Moreover, it is at times mixed-up with health inequalities, which refers more broadly to measurable differences in health between groups, without a moral judgement (41). One example of health inequities is seen in life expectancy (2019 – 2022): individuals with a higher educational level in the Netherlands live 5 years longer, and 14 years longer in good health, compared to individuals with a low educational level (42). Also for perinatal health outcomes during pregnancy and childbirth, inequities exist between and within high-income countries (43). For example, across Dutch municipalities, preterm birth rates ranged from 2.4% to 11.7% in 2021 (mean: 6.6%) (44). There are also large differences in perinatal outcomes between neighbourhoods with varying levels of socioeconomic status, as demonstrated well by the work of researchers from Rotterdam (28, 45-47).

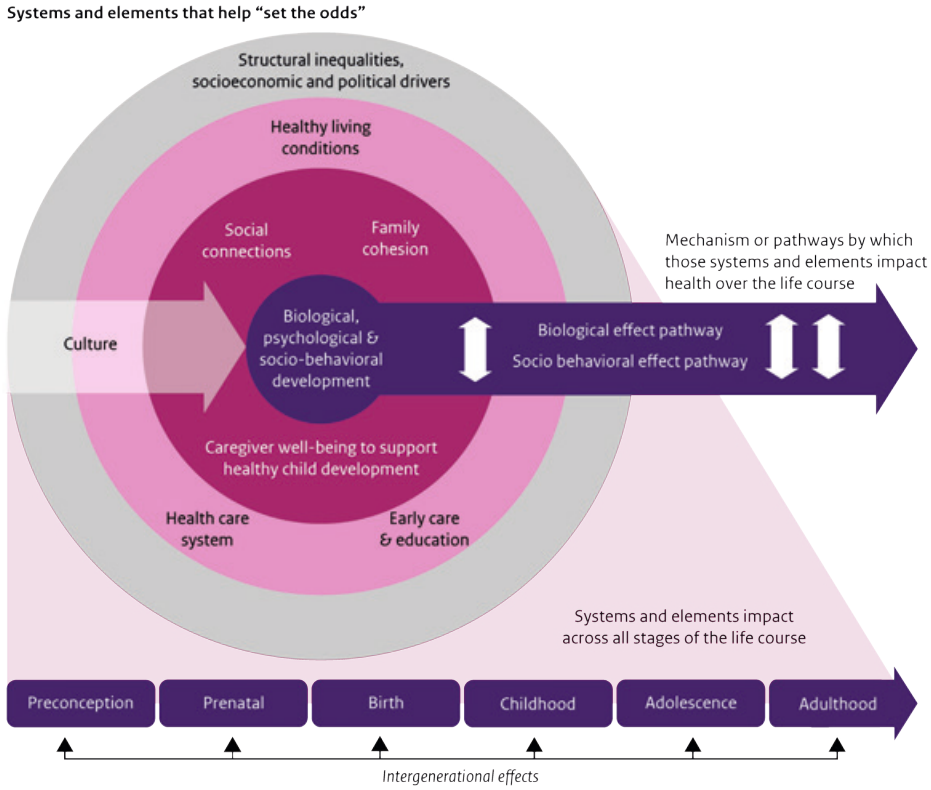



**Figure 1**. Conceptual framework 'Leveraging early opportunities to advance health equity across the life course' by the National Academies of Sciences, Engineering, and Medicine (2019) (8).

Despite accumulating evidence regarding the determinants of poor health, health inequities in birth outcomes seem to have persisted (48) and may even be widening in certain populations and for specific health outcomes (49, 50). These considerations of equity are also very important in investing in early life.

**The concept of vulnerability in early life**

Thousands of parents and children in high-income countries are exposed to adverse conditions such as poverty, violence, inadequate nutrition, substance abuse, and stress. This means that many face an increased risk or susceptibility to adverse health outcomes or decreased well-being, or they experience a lower access to care. Recent literature often uses the concept of 'vulnerability' when referring to these (future) parents and their newborn or unborn children (51-54), but terms such as 'disadvantaged', 'deprivation' or 'frailty' are also common in the scientific literature.



There are diverse and heterogeneous definitions and understanding of the concept of vulnerability around pregnancy. For example, de Groot and colleagues (2019) defined vulnerability as "a dynamic state that reflects converging effects of a set of interacting and amplifying personal and environmental factors" (p. 12), which increases a person's susceptibility to ill health and hamper their recovery (53). Scheele and colleagues (2020) referred to pregnant vulnerable women as being "threatened by physical, psychological, cognitive and/or social risk factors in combination with lack of adequate support and/or adequate coping skills" (p. 4) (54). Various stakeholders in the city of Rotterdam (2020) explained how "vulnerability arises from an imbalance between risk factors and protective factors" (55). Their definition of vulnerability includes a distinction between highly vulnerable women for whom the risk factors require immediate action (e.g. domestic violence) and vulnerable women who have one or more risk factors (e.g. unhealthy lifestyle factors, unemployment) and insufficient protective factors (e.g. supportive social network, stable home situation). The Dutch national organization for midwives (Dutch abbreviation: KNOV) described how vulnerable pregnant women face several challenging circumstances, emphasizing different risk factors (56). Briscoe, Lavender and McGowan (57) described vulnerability in three main attributes: threat, barrier and repair. Whether potential biological, psychosocial or sociological threats lead to vulnerability, depends on both the existing recovery systems available (e.g. warm supporting relationships), as well as barriers that may impede access to healthcare (e.g. stigmatization, lack of compassion).

Taken together, most definitions of vulnerability acknowledge that vulnerability encompasses a dynamic, contextualized and complex process involving the interplay of risk and protective factors at different levels or life domains (51, 53-55, 58). In simplified terms, several stressors at either the individual or contextual level can function as risk factors contributing to vulnerability, whereas protective factors have the potential to diminish or prevent vulnerability. Whether risk factors increase vulnerability and hinder people from achieving their full potential, depends on the co-occurrence and balance of risk factors and protective factors (53, 55).

When reviewing the previous literature about the influence of social factors and vulnerability on birth outcomes, it appears that most studies focus on a limited number of predetermined, single risk factors. Few authors have studied the clustering or interactions between risk factors (29, 30, 59-61). Moreover, protective factors are rarely considered in the studies. Hence, the influence of the co-existence of both protective and risk factors requires further study.

**Need for improved collaboration across the social and medical sector to address vulnerability and inequity**

Increased awareness of the influence of social factors has prompted further exploration of preventive strategies and interventions to address vulnerability and inequity during the first thousand days. While healthcare has a pivotal role in advancing health equity, it cannot effectively address health inequities on its own. Since many of the underlying determinants for health and well-being lie beyond the medical domain, addressing them requires collaboration with other domains as well. Recent literature widely acknowledges that cross-sectoral collaboration between the medical and social sector is necessary to provide children the best possible start in life (8, 62-64).

The urge for increased collaboration aligns with a wider movement in Western countries to maintain an accessible, affordable, safe and effective healthcare system. Our healthcare systems face increased pressure due to rising costs, ageing populations, changing disease patterns and care needs, and an alarming shortage of personnel (65-68). These challenges and the need to respond also applies to the maternity care population and system, with increasing maternal age, more co- and multimorbidity and unhealthier lifestyle among women of childbearing age, technological developments, and more diversity in cultural and ethnic groups (69, 70). These pressing issues also underscore the importance of implementing preventive measures and integrating medical and social care and support.

Previous research on collaboration during the first thousand days has predominantly focused on specific temporal windows within either the medical or social sector. For example, studies within the Netherlands (71-76) and other countries (77-81) explored collaboration between professionals and organizations during either pregnancy, childbirth or child service delivery. Collaboration in Dutch maternity care is often described as complex and not self-evident, as healthcare providers historically have worked relatively autonomous with separated organizational structures, education programs, protocols, cultures and practices (63, 74, 82). Few studies have devoted attention to the full period of the first thousand days within both the social and medical sectors (62, 63). Collaboration between sectors may present different challenges compared to collaboration within one sector, potentially due to larger differences in cultures and structures.

**A nationwide first thousand days-approach: Dutch action program Solid Start**

Yearly, approximately 170.000 children are born in the Netherlands (70). These children and their parents, especially those in vulnerable situations, could benefit from a more integrated and population health-based care and support system. In 2018, the nationwide

action program 'Solid Start' was launched by the Dutch Ministry of Health, Welfare, and Sport (Dutch abbreviation: VWS) to ensure that every child receives the best possible start during the first thousand days of life (83). It promotes collaborative efforts across the medical and social sector and focuses particularly on (future) parents and young children in vulnerable situations. The action program's strategic framework is built upon previous endeavours aimed at integrating medical and social services, such as the local 'Ready for a baby' program in Rotterdam (2008–2012) (84) and subsequent 'Healthy Pregnancy 4-All' programs implemented in various municipalities since 2011 (28, 62, 85). It is part of a wider movement in Dutch maternity care, which developed from a narrow focus to the mother's health during childbirth, to a more social and cross-sectoral approach for (future) parents and children in which pregnancy and early childhood is considered a window of opportunity to address health inequities and enhance overall well-being (63). Several key moments catalysed this movement. For example, the European Peristat reports showed relatively high perinatal mortality rates in 2004 and 2008 (86, 87) which created momentum for a cascade of activities (88). Activities including the establishments of maternity care networks in which midwives, gynaecologists and other maternity care providers collaborate (89), experiments with bundled payment (90) and the initiation of the Standard for Integrated Maternity Care (91).

The action program Solid Start employs a comprehensive and population-based strategy (83). It is conceptualized and implemented across three pillars: before pregnancy, during pregnancy, and after birth. At the start of the action program Solid Start, several aims were set, summarized as follows: prevent unintended pregnancies, prepare parents better for pregnancy, identify medical and non-medical issues earlier, and offer tailored support for (future) parents in vulnerable situations. The preventive and supportive measures aim to address the underlying determinants of health and well-being from an early stage, to prevent or mitigate health-related issues that may arise later in life. The program's backbone is the stimulation of cross-sectoral collaboration through local coalitions Solid Start. Municipalities are vital in creating local coalitions Solid Start, consisting of organizations and service providers spanning the medical, social and public health domain. Involved stakeholders can include midwives, obstetricians, maternity care assistants, youth healthcare providers, social workers, debt counsellors, municipal officials, experts-by-experience. Municipalities are stimulated to create their own approach that fits their local context, challenges and existing networks. Since the decentralization in 2015, municipalities were already given new responsibilities in youth care, long-term care and income-support that fuelled differences in their approach and services (92). Municipalities received financial support from the Ministry of Health, Welfare and Sport, and they were provided assistance in building or strengthening their coalition from Pharos, the Dutch Centre of Expertise on Health Disparities (93). Pharos' advisors have one-on-one meetings with municipalities, but the organization also provides shared training, webinars and informative webpages. Other support for local coalitions Solid Start included the availability of an analysis tool, data, a list of effective interventions and care pathways. Moreover, the Ministry of Health, Welfare and Sport facilitates and stimulates the action program Solid Start by striving for legal changes. Part of the action program also

includes the implementation of interventions, including 'Not Pregnant Now' that supports professionals in sustaining the autonomy of vulnerable groups in making informed choices regarding pregnancy and contraception (94).

Starting from 2019, the Ministry of Health, Welfare and Sport commissioned the National Institute for Public Health and the Environment (Dutch abbreviation: RIVM) to monitor the action program Solid Start. There are several reasons to monitor policy programs like the action program Solid Start. These reasons, for example, relate to accountability, learning and engagement (95, 96). Firstly, monitoring can be a tool to document actions and assess their alignment with predetermined plans or objectives. Secondly, monitoring for learning aims to provide insight into the approach (e.g. progress, facilitators, barriers) to allow reflection and make improvements. Thirdly, monitoring can facilitate the sharing of successes and small-wins, thereby keeping people engaged and enthusiastic. The monitoring efforts in relation to the action program Solid Start initially focus on gaining insight into how certain processes and outcomes develop over time, without determining causal effects.

In order to start monitoring the action program Solid Start, decisions had to be made on how to operationalize certain concepts (e.g. vulnerability) and which data and indicators are useful. Considering the cross-sectoral approach, a cross-sectoral data infrastructure was considered beneficial in the monitoring endeavours.

## OBJECTIVE OF THIS THESIS

The main objective of this thesis is to provide insight into the adoption of the action program Solid Start, thereby focusing on monitoring and cross-sectoral collaboration. In this thesis, the monitoring aspect relates to both the what and how to monitor, as well as the developments and experiences with the action program Solid Start.

## THESIS CONTEXT

This thesis constitutes the scientific basis for the monitoring of the Dutch action program Solid Start that is conducted by the National Institute for Public Health and the Environment. The National Institute for Public Health and the Environment is a knowledge institute that conducts independent scientific research for commissioning partners. In the case of the action program Solid Start, this is the Dutch Ministry of Health, Welfare and Sport (97). The acquired knowledge is shared with the government, professionals and the general public to support a healthy population and environment. The organization is an agency of the Dutch Ministry of Health, Welfare and Sport.

In 2019, the National Institute for Public Health and the Environment started to monitor the Dutch action program Solid Start at national level. This national monitor has quantitative

and qualitative components. For the quantitative component, a Delphi study with experts from policy, practice and research was conducted to develop a set of fifteen indicators (98). Indicators reflect both processes (e.g. percentage of municipalities with a local coalition Solid Start) and outcomes (e.g. percentage of children born prematurely and/or with a low birth weight for gestational age). Together, these indicators provide insight in both the progress of program implementation, as well as developments or trends in health and its underlying factors for parents and children (98). Several data sources are used to quantify the indicators, including questionnaires among municipalities, inquiries among national or regional organizations (e.g. among those implementing interventions), and the nationwide population-based data infrastructure DIAPER (99). DIAPER (acronym for Data-InfrAstructure for ParEnts and childRen) combines routinely collected data from three major Dutch nationwide sources: 1) Perined - the Dutch perinatal registry that collects routine care data during pregnancy and childbirth on care use and health outcomes (100), 2) Vektis – the healthcare information centre that compiles data on medical spending under the Healthcare Insurance Act (101), and 3) Statistics Netherlands (Dutch abbreviation: CBS), which collects and publishes linkable data on societal aspects, including health, welfare, income, education, and employment (102, 103). DIAPER provides a suitable source to study the action program Solid Start and its related elements, because cross-sector data is considered essential in order to gain a comprehensive understanding of cross-sector collaboration. The qualitative component includes yearly focus group discussions and interviews with those involved in the action program Solid Start, including representatives from care and support organizations (e.g. managers and care providers), Solid Start project leaders and advisors, municipal officials, representatives of national knowledge institutes and professional associations, researchers, and experts-by-experience and clients. All results of the monitor are publicly available and presented in yearly factsheets or notes addressed to the Ministry of Health, Welfare and Sport (104-107). A scientific advisory committee oversees the monitoring activities.

In 2021, the National Institute for Public Health and the Environment was also commissioned to support municipalities in monitoring their local approach within the 'learning local monitor Solid Start'. The support program centralizes learning and knowledge sharing between and within local coalitions Solid Start. It aims to encourage both starting and more developed local coalitions Solid Start to use monitoring as a tool to reflect on and design their local Solid Start approach. To do so, the National Institute for Public Health and the Environment organizes regular learning sessions with eleven local coalitions Solid Start in which participants share best practices, challenges and needs for monitoring. Those needs are addressed in thematic sessions for a wider audience, open to all who are involved or interested in monitoring or implementing the action program Solid Start at the local level.

# OUTLINE OF THIS THESIS

**Chapter 2 and 3: monitoring vulnerability**
The first two studies addressed the monitoring of vulnerability during pregnancy. The action program Solid Start specifically focuses on (future) parents and children in a vulnerable situation. Monitoring vulnerability at population-level requires more insight into the operationalization of vulnerability. We used various data-science techniques to gain insight into different vulnerability-classes with varying combinations of risk and protective factors (Chapter 2), and to identify if we could predict vulnerability at population-level using nationwide routinely collected data (Chapter 3). This led to the following overall research question: *What is vulnerability during pregnancy, and how to operationalize vulnerability for monitoring?*

**Chapter 4: indicators for local monitoring**
The action program Solid Start was quantitatively monitored at a national level right from the start of the program. Monitoring Solid Start for municipalities or coalitions at the local level may require different indicators, given the different context, informational needs and intended use. Therefore, Chapter 4 of this thesis describes how we used a Delphi approach in developing an indicator set to monitor the action program Solid Start on a local level. The research question was: *Which indicators can be used to monitor the action program Solid Start on a local level?*

**Chapter 5: developments and experiences with Solid Start and cross-sectoral collaboration**
The action program Solid Start was implemented at the end of 2018 with the aim to provide every child the best possible start in life. A key program element is to improve the collaboration between the medical and social sector by creating local coalitions Solid Start. Therefore, we aimed to describe the implementation of the action program Solid Start during the program's own first thousand days (2019, 2020 and 2021) with a specific focus on cross-sectoral collaboration. We used both quantitative and qualitative research methods to answer the following research question in Chapter 5: *What are the developments and experiences with the action program Solid Start, specifically regarding cross-sectoral collaboration?*

**Chapter 6: general discussion**
The separate and combined findings from the studies offer deeper insights into 1) the adoption of the action program Solid Start, 2) monitoring and 3) cross-sectoral collaboration. Chapter 6 discusses the main findings in light of these three elements, providing key lessons learned. The chapter proceeds with methodological considerations along with recommendations for research, a future outlook with recommendations for policy, practice and education, and concluding remarks.

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