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journal homepage: [www.elsevier.com/locate/socscimed](https://www.elsevier.com/locate/socscimed)Exploring syndemic vulnerability across generations: A case study of a former fishing village in the Netherlands<sup>☆</sup>M. Nienke Slagboom<sup>a,\*</sup>, Mathilde R. Crone<sup>a</sup>, Ria Reis<sup>a,b,c</sup><sup>a</sup> Public Health and Primary Care, Leiden University Medical Centre, the Netherlands<sup>b</sup> Amsterdam Institute for Global Health and Development, University of Amsterdam, the Netherlands<sup>c</sup> The Children's Institute, School of Child and Adolescent Health, University of Cape Town, South Africa

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## ABSTRACT

This qualitative case study uses a life-course approach to explore syndemic vulnerability in a former fishing village in the Netherlands. Building on four years of fieldwork in a low-income neighborhood, we explored salient themes between and across families and generations. Elderly community members (> 65 years) were interviewed to map village history and explore how contextual factors have affected family life, health, and wellbeing since the 1940s. We systematically traced and compared processes leading to or from syndemic vulnerability by studying seven families across three generations. Adults with at least one of clustering diseases, their parents (when possible), and their children participated in semi-structured life-course interviews.

A complex interaction of endemic social conditions, sociocultural normative processes, learned health behaviors, and disheartening life events shaped families' predispositions for a syndemic of psychological distress, cardiometabolic conditions, and musculoskeletal pain. Educational attainment, continued social support, and aspirational capabilities emerged as themes related to decreasing syndemic vulnerability.

This study demonstrates that syndemic vulnerability is potentially intergenerational and reveals the need for culturally sensitive and family-focused syndemic interventions. Future longitudinal research should focus on unravelling the pathogenesis of the clustering of psychological distress, cardiometabolic conditions, and musculoskeletal pain among young people.

## 1. Introduction

*It runs on my mother's side. Her sisters are depressed or have been depressed. An uncle of mine, he had it too. He has been in the army and lived through wars. My mother lost her parents at a young age and a lot of brothers and sisters have passed away. So maybe it's everything together ... Two brothers drowned while being out on the sea. She was 13 when her mother died and her father died a year later. She was raised by her sisters. That might be a thing that you carry with you the rest of your life.*

(Jean [pseudonym], 40 years old)

Context shapes the social conditions that cause a population to be vulnerable to disease clustering and interaction (Singer et al., 2017). Syndemic scholarship looks at the co-occurrence and synergistic interaction of multiple diseases, while paying particular attention to micro- and macrosocial factors that contribute to disease clustering (Singer

and Clair, 2003). The syndemic framework studies how disease clustering, interaction, and dissemination are shaped by human social environments by looking at the "prevailing structures of social relationships [...] as well as socio-genic environmental conditions" (Singer and Erickson, 2015, p. 161).

This study is part of a four-year applied research project exploring syndemics in Katwijk, a former fishing village in the Netherlands. In this article, we examine the intergenerational nature of syndemic vulnerability in families like Jean's, who suffer from psychological distress, cardiometabolic conditions, and musculoskeletal pain. Following Ayres et al. (2010), Willen et al. (2017, p. 326) described "vulnerability" in the context of health inequity as "the exposure to a set of conditions that render individuals and communities more susceptible to disease or disability." Building on this definition, we define "syndemic vulnerability" as a predisposition to the development of clustering and interacting diseases or health conditions that result from shared exposure to a set of adverse social conditions.

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The story of Jean's family is far from unique; it is estimated that in the European Union, 50 million people suffer from multiple simultaneously occurring conditions, and that this number is expected to increase further with the rapidly aging population (Navickas et al., 2016). Estimates of the prevalence of disease clustering among adults vary widely. This is due to a diverse measure of conditions (Aarts, 2012), including the fact that most studies have only focused on either older people or hospital populations (Violan et al., 2014).

A systematic review of 39 multimorbidity studies observed that the most commonly occurring disease combinations include osteoarthritis with cardiovascular and/or metabolic issues (Violan et al., 2014). There is evidence that depression often clusters with cardiovascular (Whooley, 2006) or painful conditions (Nerurkar et al., 2018; Stubbs et al., 2016) and an early onset of disease clustering can be linked to socioeconomic status and social conditions (Barnett et al., 2012; McCurley et al., 2019). In addition, a multitude of syndemic studies have described how micro- and macrosocial forces shape vulnerability in the clustering and interaction of mental health and cardiometabolic conditions (Lerman, 2015; Mendenhall, 2016; Mendenhall et al., 2017).

In the Netherlands, an affluent country with a strong welfare state, lower-educated groups have a significantly lower life expectancy at birth (up to 6.5 years) and disability-adjusted life years (up to 15.5 years) as compared to higher-educated groups (The Netherlands Scientific Council for Government Policy, 2018). This unequal distribution of poor health has shown to be persistent over time in European welfare states (Mackenbach, 2012; Mackenbach et al., 2008).

### 1.1. Psychological distress, cardiometabolic conditions, and musculoskeletal pain

Dutch maritime communities such as Katwijk were historically known for their close-knit families, limited migration, social stratification, religious traditions, and a distinct social structure where men often worked off-shore for weeks or months, while women stayed on-shore and took care of the family (Deursen, 2011; ter Brugge, 2015). However, due to globalization and climate change, the fishing industry rapidly deteriorated from the late sixties onwards (Deursen, 2011).

Population data from the former fishing village Katwijk presented a complex epidemiological puzzle of physical and mental health outcomes. Among women in Katwijk, yearly mortality rates are higher compared to the rest of the region, and compared to the Dutch population as a whole. More often than not, vascular diseases and psychiatric disorders are the cause of death among these women (GGD Hollands Midden, n. d.). A recent multimorbidity study in the Netherlands found that 17.5% of adults suffer from two of eleven self-reported conditions (van Oostrom et al., 2016). In Katwijk, when using the same self-reported chronic physical health conditions, multimorbidity is found to be 22%, which increases to 34% once psychological distress and chronic skin conditions are included (Slagboom et al., 2020; GGD Hollands Midden, n. d.).

An epidemiological study conducted in Katwijk shows that the most commonly co-occurring conditions are, respectively, cardiometabolic conditions and musculoskeletal pain (15%), psychological distress and musculoskeletal pain (9%), and psychological distress and cardiometabolic conditions (7%) (Slagboom et al., 2020). After testing the possible disease combinations, the study also showed that psychological distress and cardiometabolic conditions or musculoskeletal pain cluster and interact in mutually exacerbating ways, leading to a much lower quality of life than expected. Disease interaction between depression, cardiometabolic conditions, and musculoskeletal pain is most likely associated with neuroinflammation (Mendenhall et al., 2017; Narasimhan and Campbell, 2010; Nikiphorou et al., 2019), a potentially common biological mechanism, which is described as “a dysfunction of inflammatory production as a reaction to stressful events, dysregulation of the autonomic nervous system, and a destabilizing impact on hypothalamic-pituitary-adrenal axis level dysfunction.” (Yazdi et al.,

2019, p. 7). In Katwijk, the clusters of psychological and physical health conditions were found to be associated with aging, financial stress, and loneliness, but also with obesity and limited physical activity (Slagboom et al., 2020).

The poor health outcomes observed in Katwijk have also been documented in other fishing communities across the world (Turner et al., 2019a; Woodhead et al., 2018). Communities such as Katwijk are likely to be vulnerable to syndemic interactions due to their history of harsh working conditions and occupational hazards (Dolan et al., 2005; Matheson et al., 2001), as well as the adverse socioeconomic conditions in which the people in fishing communities typically live in, such as income uncertainty and poor access to health care (Turner et al., 2018; Woodhead et al., 2018). Lifestyle factors such as high levels of alcohol consumption, smoking, and poor diet (Woodhead et al., 2018) could also play a role in syndemic interactions.

### 1.2. Syndemic vulnerability in three generations

Epidemiological data on Katwijk's youth did not find a clustering of health conditions in the younger age groups. The data, did however, show higher rates of children who were overweight as well as higher rates of smoking, alcohol, and drug use, compared to neighboring communities (GGD Hollands Midden, n. d.). Adults who were overweight and had low engagement in physical activity were more likely to have the clustering of psychological distress and cardiometabolic disease or musculoskeletal pain (Slagboom et al., 2020). There is also evidence from other settings that these behavioral pathways may lead to the development of these condition clusters (Lerman, 2015; Mendenhall, 2016). Moreover, it has been shown that growing up amid parental stress related to income, work, social exclusion, and health increases the likelihood of reporting psychological distress, cardiometabolic conditions, and musculoskeletal pain or poor health in adulthood (Berger et al., 2019; Kivimäki et al., 2018; Layte and McCrory, 2018). In Katwijk, the clustering and interaction of health conditions in adults and the increased prevalence of being overweight or obese and having low engagement in physical activity in both adolescents and adults suggests syndemic vulnerability in all age groups in this community. These cross-sectional epidemiological data do not, however, provide information on families or whether these vulnerabilities were present across generations within a single family.

We use a life-course framework (Elder Jr, 1994; Elder Jr and Shanahan, 2007) to explore the intergenerational nature of syndemics. Although all syndemic studies have looked at the prolonged and multiple effects of social conditions and early adversity on adult health (Herrick et al., 2013; Mendenhall, 2016; Stall et al., 2008), few studies have focused on how local history and prevailing sociocultural normative processes may influence a community's health over the generations. This qualitative case study explores salient themes and patterns related to syndemic vulnerability across families and generations in Katwijk.

## 2. Methods

Given the limited literature on the intergenerational nature of syndemics, this paper builds on a qualitative case study design (Creswell and Poth, 2016), which is the preferential method to contextually understand an issue through the collection of data via multiple methods and sources (Donovan et al., 2011). The study protocol was reviewed by the Medical Ethical Committee of Leiden University Medical Centre, which gave the study a statement of no objection.

### 2.1. Design and sample

This study was embedded in the community-based syndemics care project “Levenslooppak” The first author conducted fieldwork (e.g. in schools, community centers, churches) among families in a

neighborhood with some of the poorest health outcomes in Katwijk from 2015 to 2019. Acceptance and sensitization were facilitated by the researcher's familiarity with local expressions of psychological distress, cardiometabolic conditions, and musculoskeletal pain based on her own personal background growing up in a Dutch Orthodox Protestant community in a family that experienced these conditions.

In the first phase, we collected oral histories to map the village's history and to explore how contextual changes affected family life since the 1940s. These data were gathered through (informal) conversations with elderly key informants (> 65 years) during participant observation sessions in a community center. Seven key informants participated in a formal life-course interview. These key informants also helped contribute to tailoring interview questions to include local expressions of health conditions. In addition, we interviewed local healthcare professionals who regularly interacted with families. Then, we analyzed secondary data sources (local books, newspaper articles, and popular religious magazines) to gather information on local concerns about family life, childrearing, health, and wellbeing. In the second phase, children, parents, and (when possible) grandparents participated in semi-structured, life-course interviews. We used two recruitment strategies through announcements in local newspapers, social media, and flyers: one focusing on the youngest generation and one on the eldest.

Inclusion criteria for families to be eligible to participate in the interviews were: 1) at least one generation had grown up in the designated neighborhood; 2) at least one of the clustering diseases "ran in the family"; and 3) two or more generations were available and willing to be interviewed. Sixteen families initially signed up for the life-course study, although only seven families met the eligibility criteria for case study analyses (Table 1).

Self-reported health conditions of the seven families were systematically assessed in three ways: 1) by means of initial screening by phone; 2) through an interview guide that allowed the researchers to systematically ask about health conditions and health behavior over the course of the participants' lives (age of onset, duration, presenting symptoms, etc.); and 3) by asking participants to rate their own and their family members' health and wellbeing on a scale from 0 to 10. This score was depicted on a visual scale, followed by interview questions that assessed the guiding principles for definitions of (ill) health and wellbeing (e.g. "What would be different if your score would be two points higher/lower?").

After drawing a lifeline to describe life events and medical history, the participants were questioned about the time and circumstances in which these events took place. Where possible, the data was collected

about the life history and conditions of the participant's spouse as well. The interviews were conducted at the participant's location of choice, most often their home. After participants read the information letter and signed consent, the interviews were audiotaped. The interviews lasted between 60 and 90 min and were transcribed verbatim. NVIVO 11 was used as a tool for analysis.

## 2.2. Analyses

We used the four core notions of life-course theory historical time and place, timing in lives, linked lives and human agency to structure our life history interviews (Elder Jr, 1994; Elder Jr and Shanahan, 2007). This framework, developed on the basis of Elder's (1974) study of families of the Great Depression, has been widely adopted to disentangle how "health trajectories shift up or downward" among historically socioeconomically disadvantaged families and populations (Jones et al., 2019). The notion of *historical time and place* addresses how individual lives are embedded in and shaped by historical processes and geographical factors. This notion allowed us to map shared exposure to social conditions and study the context in which life events occurred. The notion of *timing in lives* considers the differential impact of life transitions and events contingent on when they occur in a person's life. This notion guided the analyses of age, year, and developmental phase in which a life event occurred. The notion of *linked lives* speaks to the social networks through which individuals are linked and how these links express historical influence. This notion was used to explore the social circumstances and relations at the time of the event. Finally, the notion of *human agency* directs the gaze to how individuals construct their own life courses through the choices and actions they take within the opportunities and constraints of history and social circumstances. With a special interest in predisposition that could contribute to the development of psychological distress, cardiometabolic conditions or musculoskeletal pain, this notion was also used to explore guiding norms and values in socialization.

The data were analyzed for salient themes and patterns within and across families and generations, following the three steps outlined below:

1. Open coding of life histories and fieldnotes
2. Thematic coding and sequential analysis of life histories
3. Comparison of themes and patterns within and across families and generations

The first author coded the interviews for life and health events and transferred these into visual life lines (Appendix 2). The research team jointly reviewed transcripts and engaged in reflexive dialogues over the course of three years, which resulted in a code book based on the life-course framework. The first author and three research assistants performed a second thematic coding of all the data using this code book.

## 3. Findings

One participant, Franky (70) introduced her life history by stating: "I have always been very strong" and, "You could write a book about my life." Her life started during the famine and housing crisis of World War II. Like most elderly participants, she was born into a large family in which women took care of the children and the home while the men fished off-shore for weeks or months at a time. The family's income and food intake strongly depended on the fishing season and the catch. Life was particularly challenging in the cold winter months when fishing was interrupted and families lived off of savings and temporary jobs. The eldest of 11 children, Franky grew up in a home with a "harsh" mother who suffered from poor health. The family lost two children due to stillbirth and illness. Franky (70) linked growing up with an ill parent to her childhood experiences of care taking, frequent school absences, and always feeling tired. At the age of 12, much against her wishes, she

**Table 1**  
*Demographics of participants in the family study.*

Demographics	n
Participants (total)	22
G1 – grandparent > 68 years	5
G2 – parent < 67 years	9
G3 – (grand)child < 38 years	8
Gender	
Female	15
Male	7
Ever married	16
Religious upbringing (total)	17
G1 – grandparent	5
G2 – parent	8
G3 – (grand)child	4
Years spent in education (mean)	
G1 – grandparent	6.8
G2 – parent	9.6
G3 – (grand)child	12
Family size (mean)	
G1 – grandparent	10.2
G2 – parent	6.1
G3 – (grand)child	4.5

was pulled out of school to take care of her siblings. Her life line shows how this transition coincided with her early uptake of drinking and smoking, as well as meeting her future husband, a young fisherman with a history of severe childhood abuse.

At 16, Franky became pregnant out of wedlock, which enraged her mother and resulted in a hasty move with the father of her child to her in-laws' attic. After giving birth without her family's support, she moved between temporary houses and got married at the age of 17. To her dismay, her husband, like his father, became an alcoholic. From then onwards, she describes a decade of continued stress due to worries about housing, her and her child's safety, and her husband's alcoholism and infidelity. These worries were exacerbated by severe financial stress related to her husband's unemployment, as a consequence of the nationwide fishing ban in the seventies. Franky gained weight after giving birth to her first child (at 17 years) and suffered from gestational diabetes during her second pregnancy (at 19 years). While raising her children, she suffered from musculoskeletal pain, type 2 diabetes, and severe psychological distress:

*I laughed, but cried on the inside. [...] I cried at night, by myself. I wouldn't tell my children, but there were times in which I thought, "What kind of life is this? I think I will jump into the river, drown myself." But I couldn't, I had three children with a drunkard. [...] I stayed with him thinking, "He will leave for fishing tomorrow, [he will be away] for three or four weeks." I was lucky that he was gone a lot. I never took pills for nerves. I was able to manage everything by myself. I tried to be my own doctor.*

### 3.1. A context for syndemic vulnerability

Our study reports the general themes and patterns that emerged from the analysis of twenty-seven life histories and notes from participant observation among grandparents, parents, and children who self-reported psychological distress, cardiometabolic conditions, and musculoskeletal pain in a former fishing village in the Netherlands.

As shown in Table 1, grandparents (G1) grew up in the aftermath of

World War II, parents in the 1970s (G2), and the youngest generation (G3) in the (late) 1990s or early 2000s. Fig. 1 shows the national and local context between 1940 and 2016—the time span in which the participants grew up. The top half of the figure illustrates the macro-level state of affairs based on a desk review and interviews, while the bottom half reports micro-level changes based on interview data. Appendix 2 illustrates the life histories of three generations that grew up amid these changes.

While the individual life histories of the participants differed in many ways, all narratives echoed the local history of fishing, Orthodox Protestant religion, and rapid industrial restructuring (Deursen, 2011; ter Brugge, 2015). Our study concentrates on common emergent themes in relation to syndemic vulnerability over the course of three generations.

The following sections report on four complex interacting themes: 1) social conditions, 2) sociocultural normative processes, 3) health behaviors, and 4) adverse and early life events. All names in the study are pseudonyms, and occasionally, characteristics of participants have been altered or combined to maximize anonymization.

### 3.2. Social conditions

Not all elderly participants and key informants faced circumstances as harsh as Franky's, but many reported being exposed to similar childhood conditions.

Grandparents (G1) reported the following early physical, environmental, and psychosocial exposures that could result in vulnerability to psychological distress, cardiometabolic conditions, and musculoskeletal pain. These conditions include: the accumulation of poverty, seasonal food insecurity, unsafety, early loss, parental absence, parental illness, and social marginalization. Another shared youth characteristic was growing up in poor housing, working under harsh conditions, and lack of availability to health care. This generation also commonly reported an early uptake of drinking and smoking, and often spoke of socialization that emphasized showing perseverance, being strong, keeping silent, being obedient, and "handling things by yourself."

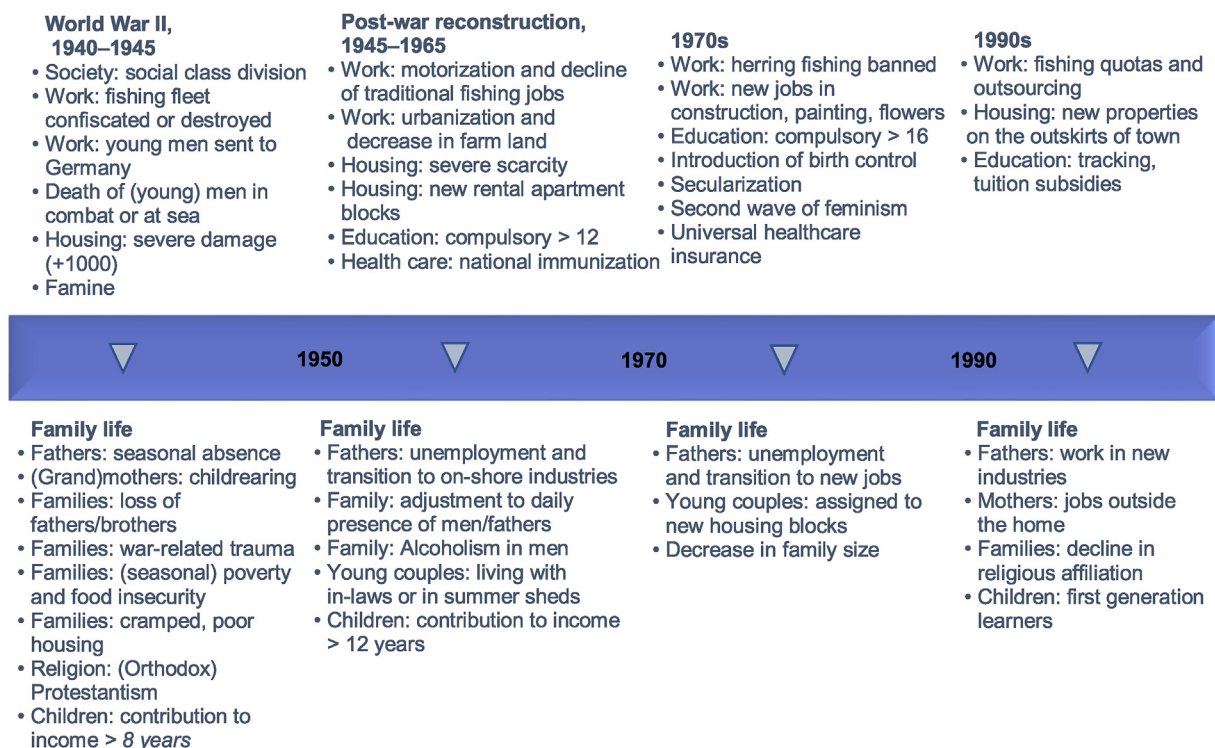


Fig. 1. Contextual changes and events affecting family experiences in Katwijk.

### 3.2.1. Working beyond one's strength

The themes of hard work and being strong emerged as explanations for the clustering of psychological distress, cardiometabolic conditions, and musculoskeletal pain.

These explanations were frequently discussed while stressing a distinct, local work ethic, which has also been documented in previous studies of this population (Deursen, 2011; El-Karimy, 1999). Singer (2009, p.20) referred to such local knowledge and beliefs as “folk syndemics.” Gertrude (64) for example, explained why “Katwijk suffers from ‘broken backs’ [gebroken ruggen]”:

*They are loyal and hard workers. [...] We always work beyond our strength. In the old days, you had to. The harder you worked, the more you earned. On board, you would not admit that you couldn't lift something.*

Shirley (72) spoke about hard work while referring to brutal working conditions:

*They [men] were only children when they [first] left for the sea. It was a hard life. They continuously worked shifts of two hours: two hours work, two hours rest. They never got out of their clothes. This could go on for weeks.*

The women most often spoke about physically straining household work. Mae (80), for example, recollected working as a maid:

*There were no mops or brooms. One had to get down on the knees on the floor for everything and the washing was done outside. We weren't allowed to eat at the dinner table. Food was served through a hatch for servants, as if we were prisoners!*

The high premium put on work and the norm of perseverance was also reflected in the way the participants discussed experiences with illness. Mabel (72), for example, said:

*We were always used to taking care of business ourselves. When we got sick, we coped. [...] I am tough on myself. [...] Even now [that I am suffering from back aches] I can't stop working.*

### 3.2.2. Contextual changes and continuities

Fig. 1 summarizes contextual changes from the 1960s onwards, showing how the decline of fishing in Katwijk occurred in the same decade as the expansion of the modern welfare state. Examples of such social security reforms were the introduction of universal health insurance in 1964, unemployment and disability benefits in 1963 and 1966, and compulsory education until the age of 16 in 1969 (Cox, 1993; Luijckx and de Heus, 2008).

Reflecting on the enormous social changes in the 20th century, grandparents (G1) came of age in a very different sociohistorical context than their children, the parents (G2) in our study. Whereas, in World War II, occupational hazards and poverty were central in the grandparents' life histories, mass unemployment and the fishing ban (Deursen, 2011) were pivotal in the parents' generation.

A comparison of the life histories of the men (G1 and G2) shows a shift from employment in the fishery, to employment in physically straining and often temporary jobs, such as painting, road building, or truck driving. It was not uncommon for the men (G2) to work two or three jobs, extending into the evenings and weekends. This observation is supported by Deursen's (2011) study of Katwijk between 1940 and 2005. Mabel (72) spoke about these changes and how they affected family life:

*First, there was very little fish to catch, in the '70s. A very bad time. It all really changed when the fishing quota came about in the '80s. One by one they lost. The boys shifted to other work: flowers or building. Most of them became builders. [...] It was a big change for women, too. All of a sudden, the husband was home every evening. That is when the divorces came in.*

Men (G2) in this study frequently spoke about a high disease burden related to (temporary) unemployment or periods of extended sick leave. Herbert (48), for example, started working as a painter at age 15, a job in which he was exposed to toxic paint fumes. After working in multiple jobs with adverse working conditions, he switched to construction in his 20s. His life history showed multiple sick leaves due to unexplained headaches, dizziness, and back pain. Another man (G2), Stan (45), spoke about worries related to his unexplained hypertension. This prohibited him from working as a truck driver and getting life insurance and a mortgage, and caused him to constantly feel anxious about his health. He stated, “It messes with your head”.

### 3.3. Health biographies

Parents continued to grow up with a greater emphasis on working hard and being strong. Related to showing perseverance, socialization also emphasized keeping quiet about one's suffering. Franky's daughter, Susan (50), summarized this lesson as: “[If] we don't talk about it, it isn't there.” Stan (45) explained that this norm extended to keeping quiet about health-related stress: “People who have those complaints [from the cluster] will not be too talkative.”

Much like Franky, families in the study often discussed their health conditions using local, descriptive terms. Local expressions included “having sugar” (diabetes), “being sturdy” or “being a healthy Dutch girl” (obesity), and having “a worn down back” or “having it in your back” (pain). Descriptions of episodes of psychological distress regularly included an element of fatigue and musculoskeletal pain that required extended bedrest. For example, across generations, the participants referred to episodes of “plat liggen” which literally translates to “lying down flat,” a term that could refer to psychological distress, as well as severe musculoskeletal pain. It was frequently discussed that doctors could not “explain or treat” this suffering, despite repeated healthcare visits.

#### 3.3.1. You didn't know better

As for health behaviors, biographies of parents (G2), such as Herbert (48) and Stan (45), showed a pattern of an early uptake of smoking and drinking: “I had my first drink when I was 12.” Much like the G1 participants, G2 participants regularly attributed the early onset of these health behaviors to growing up in an environment in which the behaviors were very common: “You didn't know better.”

In this study, it was uncommon for parents (G2) to engage in sports throughout childhood. Parents often answered questions about regular physical exercise in their youth by referring to economic restraints or sociocultural normative processes that valued working over play. Stan (45), for example, said: “I grew up in an ordinary family of workers. They didn't consider talents. What mattered was money. There was no money for such things as sports.”

Changes in health behavior were most commonly attributed to a transition to parenthood or critical health events. Stan (45), for example, ceased smoking and took up regular exercise after his first cardiovascular event. Franky's daughter, Susan (50), discontinued drinking after becoming a mother; she referred to experiences of growing up among heavy drinkers: “It was common for fishermen to drink, it was just how it was. Everybody knows. I don't drink, not one drop. I have seen the damage it can do.”

This pattern in health behaviors was largely discontinued in the third generation (G3). Children commonly mentioned growing up with family rules that strictly prohibited smoking and underage drinking and participated in physical education in school. Some children recollected occasional smoking and heavy drinking in their early adolescence: “I don't think my parents ever knew.” Much like their parents, these behaviors were often discontinued after transitioning into a long-term relationship.

### 3.3.2. Patterns in syndemic vulnerability

From the parents' generation (G2) onwards, two patterns of syndemic vulnerability emerged (Appendix 1). The first pattern showed sustained syndemic vulnerability across generations: both grandparents (G1) and parents (G2) self-reported multiple diseases from the cluster. In line with the youth epidemiological data of Katwijk, the third generation (G3) did not report multiple diseases from the cluster of psychological distress, cardiometabolic conditions, or musculoskeletal pain. They did, however, suffer from psychosocial distress and musculoskeletal pain or psychosocial distress, obesity, and musculoskeletal pain.

This is illustrated in the life history of Franky's granddaughter, Amber (17), who remembered "being chubby" from age five onwards (Appendix 2). Shaped by being bullied at school and feeling unsafe in her neighborhood, she preferred to stay indoors. At age 12, she started suffering from severe psychological distress, which was also the time in which she often missed school due to musculoskeletal pain.

Families with sustained syndemic vulnerability recollected an onset of psychological distress, musculoskeletal pain and/or obesity relatively early in life, frequently before the age of 18.

The second pattern showed a decrease from syndemic vulnerability: in contrast to the generation of grandparents (G1), parents (G2) and children (G3) did not self-report multiple diseases from the cluster of psychological distress, cardiometabolic conditions, and musculoskeletal pain (Appendix 1). Lizzy (24), for example, spoke about being obese at the age of 18. She attributed her weight gain to her and her friends' lifestyle of partying and heavy drinking during their first years of college. At the age of 20, in the same year she met her future husband and started a new job, she reports an uptake of regular exercise and, as a result, losing weight.

### 3.4. Life events

In response to the questions "Which events in your life were important to you?" and "Could you tell me something about the highs and lows in your life?", families recollected transition events (e.g. the birth of sibling, marriage, changing jobs), as well as critical or adverse events (e.g. unemployment, sudden loss of a loved one). While all biographies echoed local history, the participants' histories diverted most strongly along the lines of type, duration, and impact of the life event. In relation to syndemic vulnerability, two patterns of life-event characteristics emerged across generations and families: a pattern of cumulative stress throughout life and a pattern of singular, short stressors.

#### 3.4.1. Cumulative stress

Families that reported psychological distress, cardiometabolic conditions, and musculoskeletal pain across generations commonly spoke about a "difficult childhood." Stressors included a combination of social exclusion, violence, parental illness, alcoholism, and parental absence. These experiences were often discussed in implicit terms: "I grew up in a family of heavy drinkers."

It was also common to observe a repetition of short, educational trajectories and "early" integration into the labour market in G2, which participants linked to socialization that emphasized work, not being able to focus (men), and frequent school absences related to musculoskeletal pain and fatigue. Much like the grandparents (G1), parents (G2) grew up in an environment that emphasized being strong and keeping quiet about suffering. Susan (50), for example, said: "In that time, one simply didn't talk about it."

Parents (G2) commonly referred to the hindering effects of past (health) events on their life trajectories, as illustrated in Herbert's (48) history:

*I didn't really have a warm home, as a child. [...] My father cheated. My mother swallowed it all thinking: "I have five kids after all; they need to be fed." [...] My mother was really mostly only sad. I would see my*

*parents fight, as a young child, if he was home. That naturally scares you. I think that has been a part of my mental health problems, how these evolved. It is connected to those complaints [pain] and my depression. My youth, it's all a part of it. [...]*

*Like my daughter, I was also a bit of an outsider. I would engage with other boys who were bullied. [...] I didn't finish high school. I couldn't wrap my head around it. It was not such a smooth time [at home]. Maybe it is connected. I just couldn't study.*

The pattern of cumulative stress was observed throughout his life; parents (G2) frequently spoke about a combination of worries related to work, income, and health from their late adolescence onwards. At age 16, Herbert met his partner, Grace, who too experienced "a very difficult childhood." At this age, he also started suffering from "anger explosions," which were augmented by back and neck pain from his early 20s onwards.

*It could have been because of inhaling [toxic] fumes, or because of my breathing—I felt so sick. I also got explosions of anger. [...] The hyperventilation kept coming back. [...] The pain runs in our family. [...] I worked in construction, which included hard, laborious work. I got it in my back, which repeated every year. It only got worse, there was nothing to be done. There were times that I couldn't sit, I could only lie down, I was in terrible pain.*

For women, these processes are best illustrated in Grace's (45) life history. Much like her mother, her life started in a family that mourned over the sudden loss of a young child. She recollects a childhood in close proximity to her mother, being bullied at school, and suffering from unexplained fatigue that led to frequent school absences between the age of 10 and 12. At the age of 15, she started working as a cleaning maid, which she linked to the prevailing idea that "women are destined to get married and have children":

*I wanted to be a nurse [...] Back in the '70s, you weren't heard. Nowadays, you talk to your kids and search for their talents. In my time, the reasoning was "your sister went to household school, so should you." I could have gone much higher.*

Following her first pregnancy (at 21 years), she started gaining weight. In roughly the same years that her husband was homebound due to a severe work accident, she was confined to years of bedrest while her mother took care of their newborn. She has been suffering from severe, medically unexplained multisite-musculoskeletal pain ever since. At times, she regrets not having been able to care for her son in his first years: "Sometimes I feel like he isn't my child, as he was raised by my mom."

The pattern of "a difficult childhood" was partly continued in the third generation (G3). Herbert and Grace's children continued to grow up amid insecure income and parental illness while experiencing social exclusion and scholastic difficulties. Explicit references to violence or alcoholism in the nuclear family, however, were rare among this generation. Different from their parents, children in this study grew up in a family environment that stressed the importance of education and obtaining "a good degree". Much like Amber (17), children continued to self-report early psychosocial stress, childhood obesity, and/or fatigue and musculoskeletal pain.

#### 3.4.2. Breaking the cycle

From the parents' generation (G2) onwards, some families showed a break from the cycle of adverse early circumstances. The life histories of these families showed a pattern in which adverse events occurred as singular, distinct events, often after adolescence.

Joe's (58) biography exemplified such a life history. Following in his family's footsteps, he could have joined his uncle's workplace at the age of 14. Instead, he continued his education while working side jobs. He attributed the trajectory of his life to aspirations, curiosity, and choice of partner: "I married someone from another town; she was educated.

[...] I would tell my children: ‘Study! Make sure you get a degree!’ and my wife would say the same: ‘Study!’” In families with decreasing syndemic vulnerability, parents and children, commonly referred to choices and aspirations that enabled their educational and social mobility.

#### 4. Discussion

This qualitative case study is one of the first to systematically explore the intergenerational nature of syndemic vulnerability. We defined syndemic vulnerability as “a predisposition to the development of clustering and interacting diseases or health conditions that results from shared exposure to a set of adverse social conditions” and examined salient themes and patterns across families and generations.

The findings from this study contextualize the results from an epidemiological study in Katwijk Slagboom et al., 2020 in showing that syndemic vulnerability in this population is likely produced under conditions of continued exposure to adverse social conditions, childhood experiences, and shared sociocultural norms of perseverance. Worldwide studies support that the emotional burden of loss, seasonal income, occupational hazards, rapid socioeconomic changes, and ill health extend to the broader fishing community (Dolan et al., 2005; King et al., 2015; Smith et al., 2003). The profound impact of environmental and socioeconomic restructuring on adult health outcomes has also been described in other syndemic studies (Singer, 2009; Willen et al., 2017).

Although our results help to reconcile key findings in life-course studies (Godfrey et al., 2010; Melchior et al., 2007; Poulton et al., 2002) and syndemics studies (Herrick et al., 2013; Mendenhall, 2016), they do not fully explain the asymmetry of syndemic vulnerability given the nationwide availability of health care and education since the policies implemented in the late 1960s. In what follows, we explore the classic question of: “Why some grow up well while others don’t” (Panter-Brick, 2014) in relation to current insights on the transmission of stress and resilience.

By looking at families with sustained syndemic vulnerability, it was observed that in contrast to the older generations, the youngest generation (G3) reported similar disease clustering without having been directly exposed to harsh working conditions, violence, alcoholism, or parental absence. Previous studies have shown that such disheartening experiences might have ramifications well beyond the event itself (Danieli, 1998; Lev-Wiesel, 2007; Yehuda et al., 2001). Grandparents’ exposure to adverse social conditions and trauma could shape how children, much like their parents, consciously or unconsciously respond to cumulative and unpredictable stress in the family environment (Akello et al., 2010; Dickson-Gómez, 2002; Guthrie, 2008). Intergenerational syndemic vulnerability is potentially a product of historical trauma (cf. Denham, 2008). This possibility is substantiated by our observation of how adverse life events such as abuse, violence, alcoholism, and parental absence were discussed. In their work on historical trauma response, Labanyi (2009) and Denham (2008) described similar ways of speaking about suffering, such as joking (2009) and emphasizing ones strength while avoiding elaboration on the adverse life event itself Denham (2008).

Observations of families with decreasing syndemic vulnerability indicate that processes leading to syndemic vulnerability can be countered. While all parents in the study grew up with the challenge of unemployment, only those who completed their education moved on to secure jobs and better housing. While discontinuations in family health cannot be attributed to a single determinant, it has been shown that educational attainment (Kuntz and Lampert, 2013), as well as moving to economically better-off areas (Chetty et al., 2016; Ludwig et al., 2011), is linked to better health outcomes. It is, however, questionable whether the provision of educational and housing opportunities in itself are sufficient to counter the effects of cumulative stress, resist familial patterns, or change health behaviors. Only those who reported the

continuing availability of social support, as well as aspirational capabilities, were able to pursue further education despite the emphasis on work and prevailing age or gender expectations. This confirms previous syndemic studies that showed that education, social support, and optimism are likely to strengthen individuals’ capabilities to enhance their own well-being and negotiate adversity (Adeboye et al., 2017; Reed and Miller, 2016). Rather than a static health status, our study suggests that syndemic vulnerability is dynamic and possibly temporary.

This study does not come without limitations. Due to the difficulties of getting families to participate in the study and our strict inclusion criteria, we based our analyses on a small, purposefully selected sample of participants. The strength of this approach, however, is that it allowed for an in-depth, thoroughly contextualized exploration of experiences that are difficult to document and treat due to “silence” in families. The findings might aid healthcare providers who struggle with low uptake or adherence to interventions for highly prevalent conditions, such as obesity or psychological distress. Another limitation to this study is that we relied on self-reported conditions and recall. We did not have access to medical records and the life histories were not paired with psychiatric inventory or biomarker data, as previous syndemic studies have been. In speaking about health conditions, the line between psychological distress, musculoskeletal pain, and fatigue was often unclear; however, descriptions of psychological distress that include musculoskeletal pain have been widely documented (Bair et al., 2003). Rather than pointing to this as a weakness, we believe the lack of boundaries between these conditions demonstrates the synergistic interaction between diseases, which is the basic tenet of syndemic theory.

Research into the intergenerational nature of syndemics is tremendously complicated, as the complex interplay of time, place, and biological, social, and behavioral pathways must be taken into account. Building on a well-established theoretical framework for life-course research, our exploratory study did not look at causality nor biological pathways, but rather, focused on emerging themes and patterns within life histories. The processes that emerged from this in-depth qualitative case study need to be tested in a large-scale study of syndemic vulnerability in families that faced rapid contextual changes.

#### 5. Conclusion

This study demonstrates that syndemic vulnerability is potentially intergenerational. Multigenerational syndemic vulnerability might result from a complex interaction of endemic social conditions, disheartening life events, health behaviors, and sociocultural normative processes. Resilience can be hampered under social exclusion, and can flourish with social support, educational attainment, and self-regulatory capabilities. The observation that syndemic vulnerability can be temporary and countered is a hopeful message for the dreams of children who grew up under challenging conditions.

The multigenerational presence of disease clustering in Katwijk underscores the need for longitudinal and mixed-method research into the pathogenesis of syndemic interactions in families. Our findings show that even in a setting with well-established and generally accessible health care, the early detection and treatment of psychological distress may be hampered by locally idiosyncratic expressions of distress. This underscores the need for more research into idioms of distress in syndemics, as well as culturally sensitive and family-focused syndemic care. This could promote opportunities to take family history and dynamics into account in lifestyle adjustments or medical treatment. Future participatory studies are required to explore how care providers can integrate such a community based and family focused approach. To further the study of context, the field of intergenerational transmission of health and historical trauma is worthwhile of consideration in future syndemics research.

Finally, our data on decreasing syndemic vulnerability suggest that more research is needed to identify processes that strengthen resilience and can counter syndemics and its transmission.

## Author contribution

Nienke Slagboom: Investigation, Formal analysis, Writing- original draft. Matty Crone: Funding acquisition, Supervision, Writing- Reviewing and Editing. Ria Reis: Funding acquisition, Supervision, Writing- Reviewing and Editing.

## Declaration of competing interest

None.

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## Appendix A. Supplementary data

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