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The relationship of poverty and mental illness

An exploration of *social causation* and *social selection* theory in the German population
under the condition of stressful life events in childhood and adulthood

Die Beziehung zwischen Armut und mentalen Erkrankungen

Eine Untersuchung der Theorie der *social causation* und der *social selection* in der deutschen
Bevölkerung unter den Bedingungen von belastenden Lebensereignisse in der Kindheit im
Erwachsenenalter

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Abbreviations

ACE	Adverse Childhood Experiences
BRCS	Brief Resilient Coping Scale
CAPI	Computer-Assisted Personal Interview
EU-SILC	European Union Statistics on Income and Living Conditions
FDR	Financial Dependency Rate
F-SozU K-6	<i>Fragebogen der sozialen Unterstützung</i> , Social Support Questionnaire
GAD	General Anxiety Disorder Screener
GCS	Gutenberg COVID-19 Study
GCP	Good Clinical Practice
GEP	Good Epidemiological Practice
GHS	Gutenberg Health Study
HPA	hypothalamic-pituitary-adrenal axis
OECD	Organization for Economic Co-operation and Development
OR	Odds Ratio
PHQ	Patient Health Questionnaire
R-UCLA	Revised UCLA Loneliness Scale
SEM	Structural equation modeling
SES	Socioeconomic status
SHCB	Severe Housing Cost Burden
SSS-8	Somatic Symptom Scale
WHO	World Health Organization

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1 Deutsche Zusammenfassung

Trotz umfangreicher Forschung über den Zusammenhang zwischen Armut und psychischen Erkrankungen gibt es nach wie vor große Lücken. Zwei wichtige Bereiche sind noch nicht ausreichend erforscht: die Rolle der Depression als Moderator zwischen negativen Kindheitserfahrungen und wirtschaftlicher Belastung im Erwachsenenalter sowie die Rolle der Intersektionalität in der Beziehung zwischen psychischen Erkrankungen und Armut. Die Forschung zeigt, dass belastende Kindheitserfahrungen, wie Missbrauch oder Vernachlässigung, sowohl mit einer schlechteren psychischen Gesundheit als auch mit schlechteren wirtschaftlichen Verhältnissen im Erwachsenenalter in Verbindung stehen. Es ist jedoch unklar, ob Depressionen diesen Zusammenhang verstärkt, obwohl dies angesichts der Assoziation mit finanzieller Instabilität wahrscheinlich ist. Außerdem fehlt es an intersektioneller Forschung darüber, wie Faktoren wie die Interaktion von Geschlecht und sozioökonomischem Status die psychische Gesundheit beeinflussen. Die vorliegende Dissertation soll diese Lücken schließen, indem sie die komplexe Beziehung zwischen Armut und psychischer Gesundheit unter Verwendung der Theorien der social causation und der social selection sowie des embodiment dynamic framework untersucht.

Anhand einer repräsentativen Stichprobe mit 2,288 Befragten wurde in der ersten Studie untersucht, wie belastende Erfahrungen in der Kindheit (ACEs), z. B. Missbrauch oder Vernachlässigung, das Risiko einer Depression erhöhen und sich negativ auf die wirtschaftlichen Ergebnisse im Erwachsenenalter auswirken. Insgesamt 759 (33.2%) der Befragten gaben an, mindestens ein ACE erlitten zu haben, während 1,529 (66.8%) keine ACEs erlebt haben. Zu den wichtigsten Ergebnissen dieser Studie gehören: (1) Traumata in der Kindheit wurden mit einer höheren Depressionsrate im Erwachsenenalter in Verbindung gebracht, (2) belastende Kindheitserfahrungen wurden mit geringerer Bildung, geringerem Einkommen und höherer Arbeitslosigkeit assoziiert, und (3) Depressionen in Verbindung mit Kindheitstraumata erhöhten das Risiko von Einkommensverlust und Arbeitslosigkeit weiter. Menschen, die negative Ereignisse erlebt haben, könnten Stress durch biologische Mechanismen verinnerlichen, insbesondere dann, wenn sich die Widrigkeiten in der Kindheit auf die Neuroentwicklung auswirken. Dies kann zu einer Dysregulierung der Hypothalamus-Hypophysen-Nebennieren-Achse (HPA-Achse) führen, die eine Schlüsselrolle bei der Stressregulierung spielt und die wiederum mit langfristigen psychologischen Problemen einhergeht, einschließlich eines höheren Risikos für Angstzustände, Depressionen und Stimmungsstörungen. Dieser durch das Trauma verursachte Stress kann die kognitiven,

sozialen und emotionalen Funktionen beeinträchtigen, was die Arbeitsleistung beeinträchtigen, das Selbstvertrauen mindern und das Streben nach besseren Verdienstmöglichkeiten einschränken kann. Diese Ergebnisse untermauern die Theorie der social selection, die besagt, dass Menschen mit psychischen Krankheiten mit größerer Wahrscheinlichkeit einen sozialen Abstieg erleben, der sie in niedrigere sozioökonomische Schichten drängt.

In der zweiten Studie wurde anhand einer populationsbasierten Stichprobe (N = 8,100) zu zwei Messzeitpunkten während der Pandemie untersucht, ob und wie armutsgefährdete Personen stärker von Ängsten, Einsamkeit und wirtschaftlichen Verlusten während der COVID-19-Pandemie betroffen waren. Von dieser Stichprobe wurden 342 (4.2%) als armutsgefährdet eingestuft. Es zeigte sich, dass Personen, die bereits unter finanziellen Belastungen litten, eher von Einkommensverlusten und Arbeitszeitverkürzungen betroffen waren als wohlhabendere Personen. Darüber hinaus wurde festgestellt, dass weniger wohlhabende Personen stärker von Depressionen, Ängsten, Einsamkeit und psychosozialen Stress betroffen waren. Weniger wohlhabende Menschen sind besonders anfällig für Stressfaktoren wie finanzielle Instabilität, unzureichende Wohnverhältnisse und häusliche Gewalt, die während der Pandemie noch verstärkt wurden. Im Laufe der Zeit könnten sich die Menschen an diese Stressfaktoren angepasst haben, aber diese Anpassung könnte zu einer Verschlechterung der psychischen Gesundheit geführt haben. Im Gegensatz zu wohlhabenderen Personen, die in der Regel einen besseren Zugang zu Ressourcen und Bewältigungsmechanismen haben, ist es für weniger wohlhabende Menschen möglicherweise schwieriger, sich von diesem kumulativen Stress zu erholen, was ihr psychisches Wohlbefinden weiter verschlechtert. Diese Ergebnisse stützen die Theorie der social causation, die besagt, dass der sozioökonomische Status und die Umweltbedingungen wichtige Determinanten für die psychische Gesundheit und das allgemeine Wohlbefinden sind.

Schließlich brachten beide Studien wichtige Erkenntnisse über die Intersektionalität von Armut und Geschlecht zutage. So wurde festgestellt, dass Frauen eher von einem erhöhten Armutsrisiko betroffen waren oder einen Teilzeitjob ausübten, während sie während der Pandemie zudem mit mehr finanziellen Sorgen und psychischen Auswirkungen zu kämpfen hatten. Diese intersektionale Perspektive unterstreicht, wie Geschlecht und Gender die psychische Gesundheit und die wirtschaftlichen Belastungen unterschiedlich beeinflussen, wobei bestimmte Bevölkerungsgruppen, wie z. B. Frauen, anfälliger für Stressfaktoren wie finanzielle Notlagen sind. Insgesamt unterstreicht die aktuelle Arbeit die bidirektionale und

zyklische Natur der Beziehung zwischen Armut und psychischer Gesundheit und betont die Notwendigkeit eines intersektionalen Ansatzes bei der Behandlung dieser miteinander verknüpften Themen.

2 General introduction

Poverty has become an increasingly important issue in Germany and the whole world and demands attention, especially in the research community that focusses on health, and more specifically, mental health. Although Germany's economy is seen as quite strong, it is ranked on the 19th spot of poverty rates within the OECD countries (Statista, 2024). 11.7% of the German citizens are currently classified as poor while a total of 16.7% are at-risk-of-poverty, which is indicated by having an equivalized income of less than 60% of the median equivalized income of the German population (Statista, 2024). These numbers have had a consistent upward trend over the past decades, with 2021 being named the year with the highest poverty rates in recent history (Statista, 2023). Multifaceted factors have contributed to this continuous rise and include aspects such as economic transitions, shifts in policies, as well as unforeseen external adverse events like the onset of the COVID-19 pandemic. The pandemic's subsequent recession has halted economic growth and exacerbated poverty rates due to missing investments, job and income loss, as well as a rising inflation, turning a global health crisis into an economic crisis (European Central Bank, 2021). Although the economy recovered soon after the initial shock of the onset of the pandemic, the start of Russia's war on Ukraine and the subsequent rise in energy costs worsened the already dire cost of living and housing crisis (Q. Zhang et al., 2024). Especially those already struggling financially were disproportionately affected by these developments, experiencing significant financial strain throughout the pandemic (Adams-Prassl et al., 2020; Brodeur et al., 2021; Findling et al., 2021; Martinez-Bravo & Sanz, 2021).

Though poverty is most commonly defined by income levels, there are a variety of ways to measure poverty, reflecting both economic deprivation and other poverty-associated factors. For example, poverty can be linked to limited access to essential resources such as education and healthcare (Lacour & Tissington, 2011; Ladd, 2012; Schnake-Mahl & Sommers, 2017). Poverty can also manifest through low educational attainment since poverty has been shown to impact children's brain development, cognitive ability, as well as mental health (Blair & Raver, 2016; Noble et al., 2015). Furthermore, because of the associated stigma that comes with poverty and limited chances for social participation because of a lack of budget, it can also cause social exclusion (Stewart et al., 2009), possibly leading to a lower quality of life and

worse overall well-being (Bayram et al., 2012; Bellani & D'Ambrosio, 2011; Gross-Manos, 2017). All of these multidimensional aspects of poverty show that poverty is not just a lack of money, but can also reduce opportunities and cause a higher vulnerability for social and economic instability.

Given these multiple dimensions of poverty, it becomes clear that poverty does not only further diminish economic opportunities but also has profound implications for overall well-being. Research has consistently shown that poverty is linked to a heightened risk of both physical and mental health issues, such as cardiovascular diseases, diabetes, substance abuse, depression, anxiety, and an overall greater mortality (Barakat & Konstantinidis, 2023; Dewan et al., 2019; Franks et al., 2011; Frasquilho et al., 2015; Iemmi et al., 2016; C. Lund et al., 2010; Mar et al., 2024; Sareen et al., 2011; Schultz et al., 2018; Stringhini et al., 2017; Wang et al., 2019; Y.-B. Zhang et al., 2021). Moreover, a change in SES was associated with better (in the case of an increase in SES) and worse (in the case of a decrease in SES) health outcomes (Barakat & Konstantinidis, 2023). The abovementioned rising rates of poverty and the associated (mental) health risks underscore the need for focused research and policy intervention. Understanding and addressing the complex links between poverty and mental health is not only important for improving individual well-being but also for ensuring the sustainability of the healthcare system and the overall economy.

This dissertation is organized in the following way: First, I present the theoretical framework of social causation and social selection theory, as well as an overview of the epidemiological evidence that supports either one of both of these theories (Chapter 2). Chapter 3 revolves more about the current study at hand and discusses the embodiment framework that was used for this dissertation as well as the special role of stress and sex, which are a primary focus of this study. The main chapters of this dissertations surround the two studies “*Childhood maltreatment, depression, and their link to adult economic burdens*” and “*The burdens of poverty during the COVID-19 pandemic*” which are included in Chapters 4 and 5. The last chapter, Chapter 6, summarizes the main findings of the two studies and discusses them within the broader theoretical and empirical research context. I conclude this chapter by reflecting on future research directions.

3 Theoretical framework

3.1 Social causation and social selection theory

The complex relationship between poverty and mental health has sparked considerable debate among researchers. Significant attention has been being given to the underlying mechanisms that drive this connection. While it is widely acknowledged that poverty and mental illness are closely linked, the question remains as to why and how these two factors interact. There are two prominent theories that attempt to explain this relationship: the theory of *social causation* and the theory of *social selection*. These theories provide different perspectives on whether poverty is a cause of mental illness or whether individuals with mental illness are more likely to drift into poverty. The theory of *social causation* states that socioeconomic status and environmental conditions play an important role for an individual's mental health and overall well-being. The theory suggests that higher levels of stress, limited access to resources, and adverse living conditions associated with low socioeconomic status can lead to poorer (mental) health outcomes. In contrast, *social selection* theory, also referred to as *social drift* theory, hypothesizes that individuals with mental health issues or other health problems are more likely to experience downward social mobility, leading them to drift into a lower socioeconomic class (Dohrenwend et al., 1992). This theory suggests that poor mental health can limit an individual's ability to function well in society, which, in turn, can affect various aspects of life such as employment, education, and social relationships. Reasons for this may be that individuals can become too sick to work, struggle to perform work demands to the best of their ability, or that they simply face difficulties maintaining consistent employment (Deady et al., 2022; Gotlib & Joormann, 2010; Hakulinen et al., 2019; Jain et al., 2013; Lerner & Henke, 2008; Mall et al., 2015; Mojtabai et al., 2015).

Much research has tried to investigate how these two effects might reinforce each other and investigate whether there are differences in how they work. One study (C. Lund et al., 2011), for example, raised the possibility that the hypothesis of social causality may be more relevant to widespread mental illnesses such as depression. Depression, in particular, which is characterized by loss of interest, low energy, and feelings of worthlessness (World Health Organization, 2023), can be exacerbated by socioeconomic stressors like chronic financial strain, poor housing conditions, and social isolation, further limiting an individual's ability to achieve and sustain economic stability. On the other hand, Lund et al. (2011) argued that evidence for the social selection hypothesis may be more likely found for illnesses such as schizophrenia. Mental illnesses like schizophrenia often lead to significant impairments in

functioning, including the ability to hold a job, maintain relationships, and live independently (National Institute of Mental Health, 2024). As a result, individuals with schizophrenia may be more prone to experience downward social mobility, as they face challenges in maintaining employment and securing stable housing. Another study (Costello et al., 2003) came to a similar conclusion, suggesting that the direction of the relationship may depend on the specific disorder being studied. However, these researchers found evidence for the social causation hypothesis when studying conduct and oppositional disorders, but not for anxiety disorder and depression (Costello et al., 2003). Furthermore, researchers have also found that the indicators used to measure poverty or other poverty-related factors play a role: The systemic review by Kröger et al. (2015) observed that studies that used measures that were more closely related to the labor market to assess socioeconomic status – such as wages or employment status – were likely associated with both health selection and social causation. Indicators of SES like education or income, however, were more likely to show evidence for the social causation theory.

These distinctions discussed by Lund et al. (2011), Costello et al. (2003), and Kröger et al. (2015) further underscore the complexity of the relationship between poverty and mental health, suggesting that both the nature of the mental health condition as well as the measures used to assess poverty play a key role in determining whether social causation or social selection processes are at play. However, as pointed out, there are still inconsistencies in the literature regarding which mental illnesses are more likely to be linked to which theory. This highlights the need for further research to clarify these relationships and better understand how different mental health conditions interact with socioeconomic factors. The following chapters will now present an overview of findings regarding the poverty-mental illness relationship that may be indicative as evidence for either the social causation, the social selection or both theories.

3.1.1 Evidence for social causation theory

Many studies have found evidence for the social causation theory: Eaton et al. (2001) as well as Jayakody and Stauffer (2000), for example, have found that respondents with a low income showed a significantly higher risk of being affected by mental illnesses compared to respondents that were more affluent. Furthermore, another study found that living at the poverty-threshold was associated with a diagnosis of major depressive disorder (Kessler et al., 2003). Among older Chinese adults, it was found that lower socioeconomic status was associated with higher risk of depression; this effect was mediated by health promoting lifestyle (Y. Xue et al., 2021). More generally, research has also shown that recent loss of income

through, for example, job loss can cause or even worsen mental illnesses (Kuhn et al., 2009; Olesen et al., 2013). In fact, a recent systematic review showed that inflation further deteriorates health, especially among socioeconomically disadvantaged groups (Movsisyan et al., 2024).

Poverty is related to increased financial worries and uncertainty, which can, in turn, cause more mental distress (Ryu & Fan, 2023; Staufenbiel et al., 2013; J. Weissman et al., 2020). Moreover, it has been shown that living in poor housing conditions, i.e., living in cramped living situations or with environmental stresses such as pollution, noise, and energy poverty¹, – a circumstance closely associated with poverty – is linked to worse mental health outcomes (Bentley et al., 2023; Brown & Vera-Toscano, 2021; Evans et al., 2003; Jia et al., 2018; Klompmaker et al., 2019; Schwab et al., 1979; Thomson et al., 2017; T. Xue et al., 2019). Poverty is also associated with a higher risk to experience trauma, violence, and crime – events that can further affect mental health (Cornaglia et al., 2014; Cunradi et al., 2000; Goodman et al., 2009; Marmot, 2005). The lack of financial stability can also lead to feelings of hopelessness and a diminished sense of agency, further worsening mental health conditions (Elbogen et al., 2020). Even in longitudinal research these associations persisted: Ritsher et al. (2001) found in their study on parents and their children that parental socioeconomic status was significantly associated with a later onset of depression in the children. This effect remained even after controlling for parental depression. This result highlights the intergenerational impact poverty has on mental health.

3.1.2 Evidence for social selection theory

However, there is also a large body of research that finds evidence for the social selection theory. Starting from a young age, mental health plays a key role in an individual's academic performance. Angafors et al. (2021) studied if and how social selection (and social caution) effects manifested throughout the first 20 years of a person's academic life. They found that at all three stages (childhood, adolescence, and young adulthood) social selection mechanisms were at play: The researchers observed that behavioral and emotional problems at age 3 were predictive of academic performance at 12. Furthermore, mental health problems at 12 were linked to non-eligibility for higher education. This effect may persist throughout life and can

¹ The European Commission defines energy poverty to occur “when a household must reduce its energy consumption to a degree that negatively impacts the inhabitants' health and wellbeing. It is mainly driven by 3 underlying root causes: a high proportion of household expenditure spent on energy, low income, low energy performance of buildings and appliances.” (European Commission, n.d.)

even further increase: The workplace can increase a mentally ill individual's stress level through the pressure to meet job demands, which, in turn, can exacerbate symptoms, further limiting one's ability to succeed professionally. Some studies have found, for example, that individuals with mental illnesses are not only more likely to lose their jobs but also find it difficult to reenter the workforce once unemployed (Jayakody & Stauffer, 2000). Furthermore, they may lack the self-confidence to pursue new opportunities, making them hesitant to face new challenges or engage in job training programs that could improve their economic standing (de Quidt & Haushofer, 2016; Jayakody & Stauffer, 2000).

In the same vein, studies have also demonstrated that poor mental health was significantly associated with the individual's occupational status and economic independence (Ettner et al., 1997; Jayakody & Stauffer, 2000; Lichter & Jayakody, 2002). Those with mental illnesses, therefore, are more likely to be less educated, work in low-status, insecure jobs or even become reliant on social welfare, which might further affect their self-esteem and perpetuate the cycle of poverty (Hakulinen et al., 2019; Luciano & Meara, 2014; Sharac et al., 2010). Moreover, social drift theory highlights that poverty often reinforces social isolation (Eckhard, 2018; Walker & Bantebya-Kyomuhendo, 2014). This isolation may intensify feelings of helplessness, especially since a good network of contacts has been proven to lead to better job outcomes (Chen & Volker, 2016; Granovetter, 1973), making it even harder to break out of the poverty-mental illness cycle.

3.1.3 Evidence for both theories

A large body of research, however, finds evidence for both theories (Bierman et al., 2021; Hoffmann et al., 2019; Jin et al., 2020; C. Lund & Cois, 2018; Simmons et al., 2008; Sinkewicz et al., 2016; K. Zhang et al., 2023). The two theories together seem to create a vicious cycle where mental health issues and low socioeconomic status cause and reinforce each other, as hinted on in the passages before. For example, an individual from a disadvantaged background may be more likely to develop mental health issues due to chronic stress, inadequate access to resources such as healthcare and education, as well as social isolation. Once this individual develops mental health problems, their socio-economic status might further deteriorate as their capacity to work and participate in social activities declines. This can lead to a continuous cycle of economic disadvantage and poor mental health, trapping individuals in a downward spiral that is increasingly difficult to escape (C. Lund et al., 2010; Patel & Kleinman, 2003). This cycle can start off at various life stages. For instance, children growing up in poverty are found

to be more likely to be exposed to stressful environments, adverse childhood experiences (ACEs), and a lack of educational opportunities (Camacho & Henderson, 2022; Hoffmann et al., 2019; Lacour & Tissington, 2011; Ladd, 2012). Especially the latter has been linked to an increased likelihood of developing mental health problems in adolescence or adulthood (Zarse et al., 2019). In turn, these mental health challenges can hinder their ability to achieve economic mobility, thus perpetuating intergenerational cycles of poverty. This cycle, however, can also manifest in later life through an unexpected and sudden experience of economic decline, whether due to job loss, chronic illness, or other factors, which may increase stress, leading to the development of mental health conditions that further exacerbate their economic struggles. As such, the bidirectional relationship between poverty and mental health represents a compounding effect that can persist throughout an individual's life course.

However, research found that even though evidence for both theories was found, it differed greatly between the sexes as well as life stages. For example, in their study using U.S. nationally representative data from five different time points between the years 1986 and 2021, Sinkewicz et al. (2016) observed that the effect of females was more akin to the effect of social selection with women who demonstrated moderate depression experiencing an accumulation of reduced income later in life from which they did not recover. In contrast, for males they found more evidence for social causation. Men with a lower income in 1986 were seen to experience an increase in depression that persisted throughout the investigation. Meanwhile, Hoffmann et al. (2019) found that social causation and health selection were present during the transition from childhood to adulthood, though, in the transition between adulthood and old age, results showed that social causation was the more important effect at play. They did not find gender differences.

4 Current study

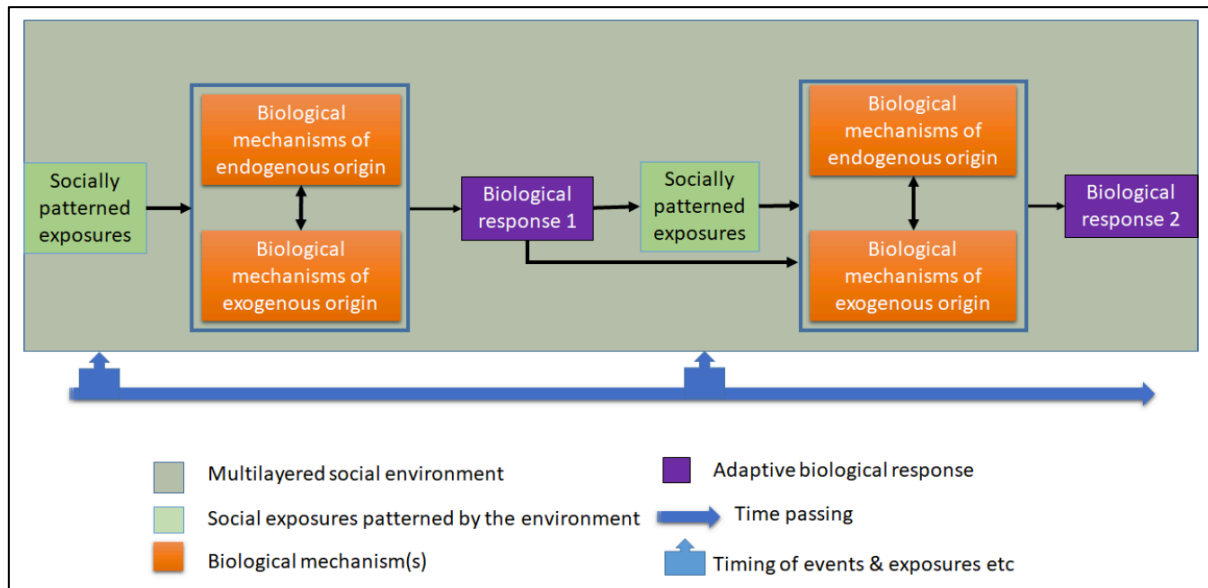
This chapter will now present the current study further by first introducing the embodiment dynamic framework, which posits that our cognitive, emotional, and physiological processes are deeply interconnected with our bodily experiences and the external environment. Within this framework and the broader poverty-mental illness relationship, stress and sex play critical roles as they influence both experiences and their biological responses in significant ways. Therefore, the roles of these two factors will be explored in separate subchapters. This chapter also discusses previous findings from other studies and current research gaps. Finally, the chapter outlines the aims of the present study and provides the research questions that guide the investigation.

4.1 The embodiment dynamic framework

Krieger (2001) contributed to the understanding of why health inequalities impact health over a long time with the term “*embodiment*”. She understands this term to refer “to how we, like any living organism, literally incorporate, biologically, the world in which we live, including our societal and ecological circumstances” (Krieger, 2005, p. 351). Thus, through a dynamic process that lasts our entire life time, our bodies embody experiences from our environment. A similar concept was proposed by Hertzman (1999), which is referred to as “*biological embedding*”. This concept is rooted in the biological sciences and linked to a socioeconomic gradient in health, which refers to the “social fact” (Hertzman, 2012, p. 17162) that health is patterned by social inequalities, with more disadvantaged groups being more at risk for various diseases and earlier mortality (Hertzman, 1999). A special focus of Hertzman’s were early life experiences and how this short window in a person’s life particularly allows for experiences to get “under the skin” (Hertzman, 2012, p. 17163). In addition, Elder and colleagues (Elder & Shanahan, 2007) helped define the principles of life-course theory. These include the view of the human development as lifelong and dynamic process, the fact that humans have agency and construct their lives by making own choices, that the human experience is embedded in a historical and geographical context, that the timing of events within the life course of an individual matters regarding the impact of the event, and, finally, that our lives are interdependent and rely on shared relationships.

The *embodiment dynamic framework* by Kelly-Irving and Delpierre (2021) integrates all of these theoretical perspectives. This framework focuses on understanding how social and biological factors interact over an individual's life course to shape health outcomes, particularly in relation to structural inequalities. The core components of this framework include the following: a socially structured environment, socially patterned exposures that are nested within this environment, biological mechanisms of exogenous and endogenous origin following these exposures that result in an adaptive biological response, as well as the time passing over the life course of an individual, and the timing of the exposures throughout this life course (see Fig. 1).

Figure 1 The embodiment dynamic framework (Kelly-Irving & Delpierre, 2021, p. 1182)



The *socially structured, multilayered environment* recognizes that a person's surroundings are multi-layered, starting from their immediate home environment and expanding to include the neighborhood, community, and the broader socio-political context. These environments are influenced by political, economic, and social forces, which shape the distinct settings in which individuals live. *Socially patterned exposures* refer to the various factors that individuals encounter across these layers. These include aspects such as housing quality, healthcare access, air and water cleanliness, and public transportation availability. Such exposures are structured by political and economic systems, often reinforcing disparities related to racism and poverty.

Furthermore, *biological mechanisms of exogenous origin* describe how socially patterned external factors, such as pollution, viruses, or substandard housing, can enter the body through ingestion, inhalation, or skin contact. These factors may have different effects on the body and social structures, such as political and economic systems, can play a role in determining who is more likely to be exposed to them. A good example is the COVID-19 pandemic, during which certain groups were more exposed to the virus due to their living or job conditions (Ahmad et al., 2020; Mutambudzi et al., 2021; Robb et al., 2024). Another mechanism is the *biological mechanism of endogenous origin*. It involves internal responses that are shaped by an individual's sensory and psychological experiences of their environment. Experiences like chronic stress or discrimination can trigger psychological responses that affect brain function and lead to long-term cognitive or physiological changes. Early childhood adversity, for example, can negatively influence neurodevelopment, leading to lifelong health challenges

(Barboza Solís et al., 2015; Castagné et al., 2018). Socioeconomic factors, such as race and education, also influence these responses, as disadvantaged populations often face higher stress levels, contributing to chronic diseases. These mechanisms lead to an *adaptive biological response*. This element highlights how the body adapts to socially patterned exposures through both exogenous and endogenous mechanisms. This adaptation process affects health outcomes as the body continuously responds to environmental changes. Additionally, the endogenous and exogenous mechanisms can interact. This shows that internal and external biological processes do not work independently; they influence one another. For example, once an external factor affects the body, it may alter how the body responds to internal processes. Similarly, biological responses to external exposures can be shaped by internal psychological or neuroendocrine factors.

Lastly, within this framework, the factor of time is important, documented by two separate elements: *time passing* and the *timing of exposures*. The *time passing* element emphasizes that embodiment is a lifelong process. *Timing* plays a critical role in how exposures impact health. For instance, early childhood is a sensitive period, making individuals more vulnerable to external stressors. In contrast, the same exposures may have less impact during other life stages. The effects of experiences vary depending on when they occur in a person's life and within their environmental context.

Kelly-Irving and Delpierre highlighted that this framework can also be combined with an intersectional approach to reveal how multiple forms of structural oppression – such as racism, sexism, and class-based discrimination – can impact health. These oppressions are not abstract forces, they are embedded in everyday experiences and shape the biological responses of marginalized groups. Intersectional theories show how overlapping systems of oppression expose certain populations to harmful exogenous and endogenous factors, like chronic stress. For instance, minority groups disproportionately experienced health impacts because of COVID-19, not because of inherent genetic vulnerabilities, but due to long-standing exposures to systemic inequalities (Lopez et al., 2021). This life-course exposure to structural discrimination and stress increases vulnerability to diseases and other health crises. The authors concluded that by using this framework, healthcare professionals can better understand the root causes of health disparities, moving away from a purely biological determinism and instead focusing on how social and structural factors shape health.

In the next chapters, we will explore two important factors for the embodiment framework: stress and sex. These elements not only shape individual experiences but also interact within the broader context of poverty and mental illness. By looking at these dynamics, this dissertation aims to better understand how they affect the connection between poverty and mental health and how these forces shape individuals' well-being through embodiment.

4.2 The role of stress

As already touched on, stress and stressors play a key role in the embodiment dynamic framework. Stress is a pervasive aspect of modern life, impacting the mental health of diverse populations. While stress can stem from various sources, those living in or at-risk-of-poverty often face heightened vulnerability to stressors, particularly financial strain (Řimnáčová & Kajanová, 2019). The pressures of limited resources and access to necessities such as healthcare and education, unstable employment, and the constant worry about meeting basic needs can lead to chronic stress, which has been shown to exacerbate mental health issues such as anxiety and depression (Ryu & Fan, 2023). This chapter explores the relationship between stress and mental health and how it relates to the embodiment framework, with a specific focus on how economic disadvantage intensifies the prevalence and effects of stressors. As this relationship is investigated, two types of stress that significantly affect individuals' mental well-being are considered: stress experienced during childhood, operationalized as adverse childhood events, and the stressors introduced by the COVID-19 pandemic.

4.2.1 Childhood trauma

Adverse childhood experiences (ACEs) are potentially traumatic events that happen in early life and include experiences such as emotional, physical, and sexual abuse, exposure to violence, neglect, witnessing a family member's mental health or substance abuse issues, as well as instability from parental separation or the incarceration of family members (Center of Disease Control and Prevention, 2024). Witt et al. (2019) found that 43.7% of respondents in a representative sample of the German population reported to have experienced at least one ACE and 8.9% reported four or more ACEs. The most frequently reported adverse events involved parental separation, substance abuse, emotional neglect, and emotional abuse. While adverse childhood experiences are relatively widespread, with nearly half of the population reporting at least one event, certain demographic groups are disproportionately affected. Research shows that individuals from lower socioeconomic backgrounds as well as racial and

ethnic minorities are more likely to experience ACEs (Mersky et al., 2021; Walsh et al., 2019; X. Zhang & Monnat, 2022), rendering ACEs as socially patterned exposures.

The timing of exposure to adverse events is also critical, as early childhood is a period of rapid neurological and psychological development (Lupien et al., 2009). These formative years lay the foundation for cognitive, emotional, and social functioning throughout life. Traumatic events during this period can have profound endogenous biological effects, disrupting neurodevelopment and impairing emotional regulation (Anda et al., 2006; Felitti et al., 1998; Heim & Nemeroff, 2001; Raymond et al., 2018). Research has shown that exposure to ACEs can heighten stress responses and anxiety, partly due to the dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis, which plays a crucial role in stress management (Kalmakis et al., 2015; Molcrani, 1997; Raymond et al., 2018). Chronic dysregulation of the HPA axis is associated with long-term psychological effects, including the increased risk of developing anxiety, depression, and other mood disorders (Heim & Nemeroff, 2001, 2001). Witt et al. (2019), for example, found that individuals who reported four or more ACEs were 7.8 times more likely to report symptoms of depression, 7.1 times more likely to suffer from anxiety, 10.5 times more likely to exhibit aggressive behavior, and 5.1 more likely to have a reduction in life satisfaction in adulthood. Moreover, ACEs can have significant neurological impacts, which, in turn, can impair cognitive functions such as attention, decision-making, and impulse control (Center on the Developing Child at Harvard University, 2010; Raymond et al., 2018). These deficits can affect an individual's performance in school and the workplace, further limiting their economic opportunities. As a result, individuals who have experienced ACEs can be more likely to face economic hardships, such as unemployment or working low-income jobs, creating additional stress and perpetuating a vicious cycle of adversity (Fisher et al., 2024; Harter & Harter, 2022; Metzler et al., 2017).

4.2.2 Pandemic-related stress

The COVID-19 pandemic has introduced an unprecedented wave of stress affecting individuals globally. As people grappled with the fear of illness, loss, and isolation, the negative effects of pandemic-related stress became particularly pronounced among vulnerable populations, especially those living in poverty. This chapter explores what kinds of pandemic-related stressors manifested, their effects on mental health, and the specific challenges faced by economically disadvantaged groups.

During the pandemic, many individuals experienced acute stress reactions due to uncertainty about health, changes in daily routines, and the social isolation imposed by lockdown measures (Brooks et al., 2020; Duby et al., 2022; Lahav, 2020). Research indicated that the fear of contracting the virus and concerns for loved ones' health contributed significantly to anxiety levels (Autenrieth et al., 2024; Mercader Rubio et al., 2022). Furthermore, social isolation, a critical aspect of the pandemic, has been linked to increased feelings of loneliness and distress (González-Sanguino et al., 2021; Kim & Jung, 2021). For many, the stress did not remain confined to mental health but spilled over into physical health issues, including sleep disturbances and increased substance use (Cénat et al., 2021; Kowall et al., 2023; Rogers et al., 2020). The pandemic-related stressors particularly affected those that were already vulnerable, either because of pre-existing health conditions or because of other (economic) disadvantages (Lahav, 2020; Leach et al., 2021).

Previous studies have found increases in anxiety and depression rates, with an especially notable rise in symptoms among individuals facing financial instability (Ettman et al., 2020, 2021; Riehm et al., 2021; Wilson et al., 2020). As has been already mentioned, the connection between economic stress and mental health is well established with financial insecurity often correlating with feelings of hopelessness and a sense of loss of control, which contributes to depressive symptoms (Hiswåls et al., 2017; Price et al., 2002). Financially disadvantaged people also faced higher risks of infection, possibly resulting in added health-related worries and stress (Ahmad et al., 2020; Mutambudzi et al., 2021; Robb et al., 2024). Those suffering from poor housing quality, which has already repeatedly been identified as a risk factor for mental health prior to the pandemic, faced additional higher mental health burdens due to being confined to these places during lockdown (Morganti et al., 2022; Newton et al., 2022; Riva et al., 2022). Furthermore, research found an uptake in domestic violence during lockdown (Piquero et al., 2021). Since people in or at-risk-of poverty are disproportionately at risk to experience this type of violence (Ahmadabadi et al., 2020), it may have also resulted in higher impacts on their mental health. Finally, less affluent individuals were among the most affected by pandemic-related financial worries. During the pandemic, many low-wage workers faced the dual threats of job loss and reduced working hours, leading to significant cuts in income (Eurostat, 2020; Wilson et al., 2020). Financial insecurity during the pandemic has been linked to a range of mental health issues. Research indicated that low-income individuals reported higher levels of stress, anxiety, and depression compared to their more affluent counterparts (Argabright et al., 2022; Wilson et al., 2020).

Another particularly affected group that was identified were children and youths, who may have experienced the most significant and lasting effects (Melchior, 2023; Miao et al., 2023; Samji et al., 2022). The COVID-19 pandemic disrupted significant life events for young people, such as graduations and transitions to higher education or work, possibly leading to feelings of loss and frustration. Without regular face-to-face interaction, many youths faced greater risk for mental health issues such as anxiety, depression, and loneliness (Farrell et al., 2023; Liozidou et al., 2024, 2024). Moreover, young adults were shown to experience a sort of polycrisis with the pandemic, the onset of the Ukraine war, as well as climate change causing stress and deteriorating their mental health (Kałwak et al., 2024). Additionally, an increase in child maltreatment has also been reported (Calvano et al., 2023). As mentioned before, according to Kelly-Irving and Delpierre's embodiment framework, experiences during critical developmental periods can shape long-term health outcomes. The pandemic, as a prolonged stressor, may have become biologically and psychologically embedded, leading to potential long-term mental health challenges like anxiety and depression.

Finally, research consistently shows that women are disproportionately affected by mental health challenges, not only during the pandemic but also prior to it, making them particularly vulnerable to pandemic-related stressors. Given that women face both greater mental health impacts and financial disadvantages, it underscores the need for an intersectional approach. The following chapter will explore in more detail the significance of sex in discussions around the connection between poverty and mental health, as well as the value of intersectional research.

4.3 The role of sex and intersectionality

A key factor moderating the poverty-mental illness relationship is sex². Research has found that not only are women more likely to fall into poverty than their male counterparts, they also consistently report higher mental distress levels (e.g., Christopher et al., 2002; Otten et al., 2021). Therefore, it is valuable to investigate the poverty-mental health relationship through an intersectional lens. Intersectionality theory, rooted in Black feminism (P. H. Collins, 1998; Crenshaw, 1997), provides a framework for understanding how marginalized identities – such

² Sex typically refers to biological differences between males and females, while gender encompasses a broader range of psychosocial factors that define the experiences of individuals in society as men or women (Eagly & Wood, 2016; Tannenbaum et al., 2016). In this dissertation, “sex” is used primarily, as respondents were either directly asked about their sex (male/female) or their sex assigned at birth was inquired. “Gender” is used when referring to societal or cultural roles.

as race, gender, and socioeconomic status – interact to create unique challenges and risks. Individuals facing multiple forms of marginalization experience compounded burdens that cannot be fully understood by examining each identity alone (Bauer, 2014; Denise, 2012; Kelly, 2009; Williams et al., 2012). For instance, the effects of poverty can vary significantly across different sexes and genders, indicating that socioeconomic disadvantages intersect with gender identities to produce distinct health outcomes.

To begin, it is important to discuss the role of sex in poverty. The “feminization of poverty” (Pearce, 1978) – which refers to the fact that women face a higher likelihood of being poor compared to men, that this heightened incidence is only becoming worse as the gender inequalities increase, and that their poverty is perceived as more severe (Parliamentary Assembly of the Council of Europe, 2007) – has long been a topic of discussion. Though the gender pay gap has not widened in the past couple of years, we still find that German women earn around 18% less than men with West German women earning 20% and East German women ‘only’ earning 6% less than their male counterparts (Federal Statistical Office, 2021, 2024b). Compared to the other 26 EU nations, Germany ranks on the fourth last place and is, thus, one of the EU-countries with the largest gender pay gap; the EU-average of the gender pay gap is around 12.7% (Federal Statistical Office, 2024a). When adjusted to measure differences between the sexes with comparable qualifications and employment experiences, the gender pay gap remains at 6% (Federal Statistical Office, 2021, 2024b). But where do these discrepancies come from?

According to the German Federal Statistical Office (2021), 71% of these discrepancies can be explained by structural differences between the sexes: For one, women tend to work in sectors that get paid significantly less than jobs that men tend to choose. Additionally, women are less likely to work in leadership roles than men, which can also be attributed to breaks in their employment due to childcare responsibilities (Federal Statistical Office, 2024b). Being responsible for childcare also plays a role in the decision to work part-time: In 2019, women between the ages 20 and 64 were more likely to work part-time than men (47% vs. 9%; Federal Statistical Office, 2021), the primary reasons that the respondents reported were care of children and other family members, as well as other family-related responsibilities. Data showed that the gender pay gap begins to drastically increase from the age of 30, presumable because women at this stage are moving into part-time employment due to the aforementioned childcare responsibilities while men often increase their work hours during the same period (Federal

Statistical Office, 2024b; Schrenker & Zucco, 2020). Single mothers have consistently been linked to the highest poverty rates, most likely due to these reduced working hours, which resulted in a deficit in work experience. Thus, motherhood has been reported as the primary cause for poverty for women (Christopher et al., 2002). Moreover, since most pension systems are earnings-related, women who take these employment breaks and/or choose to work part-time face significant reductions in pensions when they retire (Falkingham et al., 2010). These labor and income inequalities, as well as disparities in education, property holding, social benefits and other gendered disadvantages accumulate over the course of a woman's life, can lead them to enter their older years with fewer resources than men (Gornick & Boeri, 2017; Vera-Sanso, 2010).

Regarding mental health, it is well established in research that there are differences in mental distress between the sexes with women being generally more affected by disorders such as anxiety or depression (Tibubos et al., 2021; World Health Organization, 2017). Females report more often depression or depressive symptoms as well as anxiety and somatic complaints compared to men, regardless of the measurement scale and the country (Otten et al., 2021; Van De Velde et al., 2010). In the Western world, it has been reported that women are twice as likely to be affected by depression than men (Piccinelli & Wilkinson, 2000). Contrarily, men have been shown to be more at risk to commit suicide (Otten et al., 2021). These differences in depression are typically linked to the genetic, neurohormonal, or psychobiological differences between the sexes (Javanbakht et al., 2016; Kuehner, 2003; Otten et al., 2021). Other, cross-national research showed that variations are also of social origin, i.e., gender roles (M. M. Weissman, 1996). Therefore, most current research agrees that the gender differences in mental illnesses such as depression come from a mix of biological, psychological and social factors (Hopcroft & Bradley, 2007).

Socioeconomic status also plays a role in the gendered differences: A recent systematic review (Otten et al., 2021) found that the link between sex and mental health was moderated by socioeconomic factors, including employment, education, housekeeping, childcare, and income, that are gendered themselves as pointed out before. Van de Velde et al.'s study on European cross-country gender differences came to similar conclusions with a good socioeconomic position being associated with lower risk of depression in both sexes (Van De Velde et al., 2010). Furthermore, a study examining gender and socioeconomic inequalities in mental disorders among children, adolescents, and adults up to 30 years old found that low-

SES males were significantly more likely to be diagnosed with externalizing disorders, such as substance use, conduct disorder, psychosis, or ADHD (Mar et al., 2024). The risk for these conditions was three to four times higher for low-SES males, and even eight times higher for psychosis compared to the reference group of medium- to high-SES females. In contrast, the study found that low-SES females faced a twofold higher risk of being diagnosed with internalizing mental illnesses like depression or anxiety. Existing literature has already identified these gendered differences in the types of mental disorders, highlighting the distinction between internalizing and externalizing conditions between the sexes (Dalsgaard et al., 2020; Steinhausen & Jakobsen, 2019).

Despite the growing research on sex- and socioeconomic status-specific mental health disparities, there is a notable lack of studies examining how these factors intersect and exacerbate one another's impact. Much of the existing literature tends to focus exclusively on one sex, often neglecting comparative analyses with findings from the other sex in similar socioeconomic contexts. For example, while numerous studies explore the impact of adverse childhood experiences on the mental health of low-income women (e.g., Cambron et al., 2014, 2015; Mersky et al., 2018), similar investigations into low-income men are largely absent. This gap in intersectional research complicates efforts to compare gendered differences in mental health within lower socioeconomic strata. Therefore, integrating the intersectionality approach into research methodologies is essential for investigating the complex ways in which multiple identities contribute to health disparities.

4.4 Own previous research findings

In the previous chapters, we explored the role of stress and sex in shaping the complex relationship between poverty and mental illness. We examined how chronic stress, often intensified by poverty, acts as a key mechanism contributing to mental health challenges. We also considered how sex and gender influence the experience of poverty and mental illness, highlighting differences in vulnerability and coping mechanisms. In this chapter, we now turn to the findings of my own previous research, delving deeper into the complex relationship between poverty and mental illness. These findings shed light on how the socioeconomic pressures of poverty manifest in worse mental health outcomes and provide a better understanding of the pathways connecting poverty and psychological well-being.

In a study (Hettich-Damm et al., 2023), using data from the Gutenberg COVID-19 Study (GCS, $N = 9,145$) from two different measurement time points during the pandemic, we examined if having a partner and/or children impacted the quality of life of the respondents, if there are gendered differences, and if other factors, such as socioeconomic status, affected the outcome. We found that, among other variables, male sex and high socioeconomic status were found to be protective factors; women with children under 14 as well as single mothers showed significantly lower quality of life.

Furthermore, in another study (Reinwarth et al., 2024) on the psychometric evaluation of the F-SozU K-6 (*Fragebogen der sozialen Unterstützung*, Social Support Questionnaire) in an older population using data from a representative survey ($N = 706$), we found that equivalized income and sex were associated with perceived social support, indicating that individuals with a lower income (under 1200€) and male respondents suffered from decreased levels of perceived social support. Another study (Petersen et al., 2024) analyzed the overall temporal stability and trajectory of the Brief Resilient Coping Scale (BRCS) before and during the pandemic using GCS data ($N = 6,009$) and a subsample that included pre-pandemic data from the Gutenberg Health Study (GHS, $N = 3,414$). We additionally tested if the trajectory and temporal stability of the BRCS differed between various socioeconomic groups. We found that people at-risk-of-poverty were affected by significantly lower levels of resilient coping during the first two pandemic time points compared to more affluent respondents. Similar results could be found between men and women with the latter reporting lower levels. Both in the group of people at-risk-of-poverty and in the group of women we found higher temporal stability than we found for their respective counterparts, which indicates that these groups might find it harder to sustain resilient coping in stressful situations. A related study (Petersen et al., in review) that we conducted on the Somatic Symptom Scale (SSS-8), also using data from the GCS ($N = 5,341$) revealed similar results: Women and people at-risk-of-poverty consistently reported higher somatic symptom load compared to men and those not at-risk. Again, we found that the less affluent respondents had a higher temporal stability than the more affluent group. When looking at differences between the sexes, we observed that men showed a higher temporal stability than women.

In a longitudinal study using GHS data ($N = 12,404$) from two different time points five years apart, we applied a cross-lagged panel model in order to investigate if we find evidence for social causation and/or social selection in the bidirectional income-depression relationship

(Wicke et al., 2022). Additionally, we tested if we find gendered differences. Results showed a small but significant negative effect of depression on equivalized income, that remained even after adjusting the model for sociodemographic characteristics such as educational attainment as well as physical health. We did not find a significant effect of equivalized income on depression or gendered differences. These results may indicate evidence for the social selection theory.

Lastly, in a still unpublished study (Petersen et al., in preparation) using data from, once again, the GCS and GHS ($N = 2,287$), we investigated if those that are suffering from severe housing cost burden (SHCB), as indicated by spending at least 50% of one's net income on housing costs, were more affected by mental distress, loneliness, as well as psychosocial stress over the course of the pandemic. Only $N = 98$ of the total sample suffered from SHCB, while $N = 2,198$ did not. However, we found that those with high housing costs consistently reported higher levels of depressiveness, loneliness, and psychosocial stress, before as well as during the pandemic. We applied a conditional latent growth model to further investigate the association between housing cost and distress. Results confirmed the association between SHCB and a higher level in the abovementioned factors, even after controlling for sex, age, socioeconomic status, and migration background. Sex was additionally found to be positively associated with the slope of the depressiveness and psychosocial stress models, indicating that female sex was predictive of an increase in those factors across the pandemic.

4.5 Research gaps

Despite the considerable body of research linking poverty and mental illness, several critical gaps remain unexplored or underdeveloped. Two of these gaps pertain to role of depression as a moderator between adverse childhood experiences and adult economic hardship and the intersectional dimensions of mental illness and poverty: As discussed in a previous chapter, a growing body of research has demonstrated that adverse childhood experiences, such as abuse, neglect, or household dysfunction, are associated with both poorer mental health outcomes and increased likelihood of experiencing economic hardship in adulthood. Moreover, ACE's have also been linked to worse economic outcomes in adulthood (Boden et al., 2007; Currie & Spatz Widom, 2010; Fahy et al., 2017; Harkonmaki et al., 2007; T. Lund et al., 2013). However, so far, it remains unclear how and if depression acts as a moderator in the childhood adversity – economic outcome relationship. Since depression is also linked to worse financial stability and lower economic outcome, it is likely that it exacerbates the effect of childhood trauma on

financial wellbeing in adulthood. Additionally, as noted before, one of the most glaring gaps in the literature on poverty and mental illness is the lack of intersectional research that examines how sex and socioeconomic status interact and influence the impact on mental health. While there is a general acknowledgment that poverty disproportionately affects certain groups, such as women and racial minorities, the specific mental health burdens these populations face have been insufficiently explored through an intersectional lens. By filling these research gaps, future studies could lead to more effective and targeted mental health interventions tailored to the experiences of different groups.

4.5.1 Research questions and method

In this study, the embodiment framework is applied by first investigating how adverse events in childhood may have impacted an individual's socioeconomic status in adulthood, and then exploring how the onset of a pandemic may have increased stress and impacted an adult's mental health. Given the identified research gaps, the aim of this dissertation is to achieve several key objectives: (1) to examine the role of depression as a moderating factor in the relationship between trauma and economic burden, shedding light on how mental health can influence economic stability; (2) to investigate specific differences between sexes in individuals at-risk-of-poverty, focusing on how these disparities affect mental health outcomes; and (3) to analyze the unique stressors experienced by those at-risk or living in poverty during a pandemic, identifying both common challenges and variations based on socioeconomic status. Through this comprehensive exploration, this dissertation seeks to contribute valuable insights into the dynamics of stress, mental health, and economic disadvantage across the life course.

The first study was based on a representative study of the German population. In this study, economic burdens are defined as one of the following aspects: having an equivalized income of $\leq 1,126\text{€}$, having a lower level of education, working part-time or a blue-collar job, currently being unemployed or having a higher risk of unemployment.

Based on the literature, the following research questions were examined:

- 1) Does the experience of adverse childhood events negatively affect an individual's mental health?
- 2) Does the experience of adverse childhood events increase the risk of experiencing an economic burden in adulthood?
- 3) Does depressiveness moderate the relationship between adverse childhood experiences and economic burdens?

- 4) Are there gendered differences regarding economic burdens?

The second study drew its data from the Gutenberg COVID-19 Study (GCS). People at-risk-of-poverty were compared to those that were not regarding their economic impact during the pandemic (i.e., job or income loss), psychosocial stress, mental distress, and loneliness. We additionally explored sex-related differences. The following research questions were addressed:

- 1) Are people at-risk-of-poverty more vulnerable to
 - a. negative economic and employment impacts, and
 - b. poor mental health during the COVID-19 pandemic?
- 2) Are there additional sex-related differences?
- 3) Are there differences between the two survey time points regarding the wealth and mental health gap?



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Childhood maltreatment, depression and their link to adult economic burdens

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Background: Adult depression is a common consequence of adverse childhood experiences. There is also a higher likelihood of being affected by economic burdens after having experienced a traumatic event in childhood. As depression has been associated with economic burden, these long-term sequelae of childhood adversity are likely to interact.

Goals: We investigated depression and economic consequences, such as unemployment, lower level of education, lower income as long-term sequelae of adverse childhood experiences in adulthood and their interaction.

Methods: Childhood Maltreatment was measured by the German version of the Adverse Childhood Experience (ACE) questionnaire. Depression was measured by the Patient Health Questionnaire (PHQ-2). Logistic regressions were applied to investigate the risks of suffering economic burdens, with depression as a moderator.

Results: Depressive symptoms increased with the number of ACEs and were highest in those reporting four or more ACEs, especially amongst those who experienced sexual and emotional abuse, as well as neglect. Moderation analysis showed a significant effect of depression increasing almost all economic burdens. Migration background additionally increased the risk of unemployment and working in a blue-collar job. Female gender decreased the risk of unemployment and working in a blue-collar job, but increased the risk of low income and part-time employment.

Conclusion: The moderation effect of depression increased the negative impact of exposure to multiple ACEs on economic life in adulthood. Prevention of ACEs and early intervention are needed to prevent the mental health and economic consequences.

KEYWORDS

adverse childhood experiences (ACE), depression, economic burdens, poverty, unemployment, education

Introduction

Adverse Childhood Experiences (ACEs) are a common phenomenon. In representative studies up to 43.7% of respondents of the German population reported having experienced at least one adverse childhood experience, which includes emotional, physical and sexual abuse, as well as neglect and household dysfunction, such as domestic violence and drug abuse (1). Most respondents who have experienced an adverse event in their childhood have also been exposed to at least another adverse event, with 8.9% reporting at least four or more ACEs (1). Studies repeatedly showed that having experienced one ACE increased the risk of experiencing another one. For example, Clemens et al. (2) reported that having witnessed domestic violence increased the risks of sexual abuse by 4.4 times, of emotional neglect 6.5 times, of physical abuse 8.8 times, and the risk of physical neglect even by 10.3 times. In another study, Clemens et al. (3) found that having grown up in a family with mental illness or substance abuse history increased the risk of child maltreatment 5.07–5.63 times and the risk of physical abuse by 6.81 times as well as the risk of physical neglect by 6.91 times.

Additionally, studies have also found strong associations between the occurrence of ACEs and negative psychological, emotional, social, health and economic outcomes (1, 4–8). Adverse events in childhood have been consistently identified as risk factors for depression in the past decades (3, 9–11). Being exposed to any ACE increased the likelihood of experiencing depression by almost three (12) to four (1) times. A cumulative experience of multiple ACEs lead to stronger associations, increasing the ratios for depression up to OR = 7.8 (95% confidence interval: [5.45; 11.13]) (1). Furthermore, having experienced traumatic experiences in childhood has been associated with higher risks of anxiety, negative repetitive thinking, dysfunctional metacognitive beliefs, stress systems dysregulations, as well as advanced biological aging (13–16).

According to stress sensitization theory, having experienced adversity in childhood can reduce a person's coping ability in stressful times, leading to greater reactivity and more depressive reactions compared to people who did not experience such events (17). This may lead to a so called "ripple effect" from early consequences of childhood trauma, such as, for example, an increased risk of lower educational achievement due to increased stress and/or mental health issues, to a decrease in one's economic productivity in later adult life. This includes increased unemployment, reduced working hours, working lower paid jobs, or permanent sick leave and may contribute to negative economic long-term consequences and lower social class membership (3, 4, 6, 18–22). More studies described a "greater risk of sickness absence, having less assets, requiring income related support, experiencing financial insecurity and belonging to lower social class (odds ratios ranged from 1.73 to 2.98)" [(23), p. 129]. Fergusson et al. (24) also showed that lower gross income and welfare dependency were significantly

associated with childhood sexual abuse, though the effect on income became insignificant when covariates were added. This effect remained significant among women, maybe because they are more likely to experience sexual abuse than men (22). Thus, gender seems to play a significant role in the manifestation of economic burdens for people with childhood trauma. For example, even after controlling for family SES and other variables, a significant negative effect of abuse on employment emerges, but only for women (20). Additionally, it has been observed that women in particular face a greater risk of suffering from economic stress later in life following a variety of ACEs (6). Physical maltreatment of women was significantly associated with reduced SES (25, 26). In contrast, in another study, men reported lower income and working hours following severe physical abuse in childhood; the effect was not significant for women (27).

In addition to these personal economic consequences following the experience of childhood maltreatment, researchers also began to evaluate the overall average economic lifetime costs of nonfatal childhood trauma and maltreatment in terms of medical costs, productivity losses and even in criminal justice costs. Fang et al. (28), for example, estimated total costs of all childhood trauma victims in the US as approximately \$124 billion in 2008. Peterson et al. (29) updated these estimates from \$210,012 to around \$830,928 per non-fatal child maltreatment victim across their lifetimes, which raises the total costs of all non-fatal maltreatment cases to \$428 billion. For Germany, the estimates of the same year ranged between 11.1 and 28.8 billion Euros (30).

As most of the current research is on non-German samples, this study aims to add to the growing research on the association between adverse childhood experiences and negative economic (as well as academic) outcomes in later life for Germany to understand better this complex interplay and to potentially aid in finding solutions to this big social, mental health and economic issue for a considerable part of the German population. We hypothesize, based on existing research, that ACEs negatively affect a person's mental health, increasing the risk of depression. We further hypothesize, that there is also an association between ACEs and economic burdens, such as lower levels of education and unemployment. Finally, due to the abovementioned "ripple effect" ACEs have on depression and depression on economic outcomes, we hypothesize that the associations between ACEs and economic burdens are moderated by depression. Finally, we assume gender effects regarding the negative psychological and economic outcomes.

Materials and methods

Data

A nationwide representative survey conducted by the independent institute for polling and social research (USUMA

Berlin) was performed between December 2020 and February 2021. In total, 2,519 participants were included. However, we excluded all participants under the age of 25 since, by this time, they have finished their early adulthood stage and typically have become economically independent. This left us with a sample of 2,288 respondents (90.8% of the total sample).

Measures

Sociodemographic information such as age, level of education, occupational status, times of unemployment, current occupation, net household income and migration background were asked of all participants of this study. Additionally, the equivalized income was calculated according to the Organization for Economic Co-operation and Development (OECD) (31). Adverse childhood experiences were surveyed using the German version of the ACE Questionnaire which consists of 10 items that inquire about child maltreatment and problems at home in childhood using yes/no answer categories (4, 32). Depression was measured using the Patient Health Questionnaire-4 (PHQ-4) which includes two items from the PHQ-9 and two items from the General Anxiety Disorder Screener (GAD-7) (33). Study participants were asked to assess how much they were impacted by the symptoms during the past 2 weeks on a 4-point scale ranging from 1 = *not at all* to 4 = *almost every day*. The subscale of PHQ-4 (PHQ-2) exhibits sufficient reliability (Cronbach's alpha = 0.72). In order to estimate the prevalence of depression, we used the validated cut-off value of ≥ 3 (34).

Statistical analysis

First, we examine if we find a cumulative effect among the ACEs on depression by correlating the frequencies of ACEs (0, 1, 2, 3, 4+) with depression (PHQ-2), and with economic burdens [lower level of education, occupational status, blue collar occupation, frequency of unemployment and having an equivalized income of less than 1,126€, which is defined to be the 2020 at-risk-of-poverty threshold in Germany by the German Federal Office of Statistics (35)] using odds ratios. Second, we performed structural equation modeling (SEM) with the same variables as outcomes and added interaction terms to test if depression moderates the associations between ACEs and economic burdens. Before computing the interaction terms, we centered the predictors around their means (36). We then controlled for gender and migration background.

All calculations were performed using the statistical program R (version 4.1.2, packages: psych, naniar, polCA, tidyLPA, tidyverse, lavaan).

Results

Demographics

One thousand ninety-one (47.7%) of the respondents were male with a mean age of 53.3 years (SD = 16.1). The full description of the sample can be found in Table 1. One thousand five hundred twenty-nine (66.8%) of the respondents reported having suffered no ACEs, 759 (33.2%) reported at least one. Compared to respondents without ACEs, more participants who reported ACEs had no academic degree (4.4 vs. 1.2%, $p < 0.001$). Furthermore, they had graduated less from secondary school (middle educational level; 39.3 vs. 45.4%, $p = 0.007$) and were less likely to hold a university degree (9.1 vs. 12.7%, $p = 0.013$). Regarding their current occupational status, respondents with ACEs were less likely employed full-time (37.7 vs. 49.0%, $p < 0.001$) but rather part-time employed (14.1 vs. 9.5%, $p = 0.001$) or currently unemployed (9.6 vs. 4.1%, $p < 0.001$) than their counterparts. Additionally, they were also more likely to have been unemployed at least twice (twice: 17.4 vs. 11.4%, $p < 0.001$; three times: 9.0 vs. 5.4%, $p = 0.002$; four times or more: 10.1 vs. 4.4%, $p < 0.001$). Participants with ACEs more frequently reported to be working blue collar jobs than participants without ACEs (26.8 vs. 22.7%, $p = 0.039$) and their mean household income was significantly lower (2,532.5 [SD = 1,538.3] vs. 2,859.5 [SD = 1,569.4], $p < 0.001$). Respondents with ACEs were more likely to have a migration background (15.5 vs. 9.7%, $p < 0.001$). And finally, they also exhibited significantly more likely symptoms of depression (15.9 vs. 10.1%, $p < 0.001$).

A total of 262 (11.5%) reported to have experienced one ACE, 138 (6.0%) two, 119 (5.2%) three, and 240 (10.5%) four or more ACEs. Emotional abuse was cited the most (363, 15.9%), followed by parental separation or divorce (324, 14.2%), physical abuse (288, 12.6%), substance abuse in the home (285, 12.5%), and emotional neglect (283, 12.4%). Incarceration of a family member (67, 2.9%) and sexual abuse (86, 3.8%) were mentioned least frequently.

Associations between number of ACEs, depression and economic burdens

For individual ACEs, as well as multiple ACEs, we found significant moderate to strong associations with depression, income, level of education, current unemployment, blue collar education and higher risk of unemployment (see Table 2). The associations between the individual ACEs and depression ranged from OR = 2.80 (parental separation) to OR = 6.35 (sexual abuse). However, the highest associations were found for the cumulation of ACEs (ACE load) on depression. Additionally, no ACEs showed a significantly lower chance of depression (OR = 0.17) compared to the occurrence of four or more ACEs (OR = 10.20).

TABLE 1 Descriptive overview of social demographics of respondents who reported ACEs and those who did not.

	Sample N = 2,288	With ACE N = 759, 33.2%	No ACE N = 1,529, 66.8%	p-Value
Gender (men)	1,091 (47.7%)	360 (47.4%)	731 (47.8%)	0.900
Age				
25–35	364 (15.9%)	120 (15.8%)	244 (16.0%)	0.976
36–45	399 (17.4%)	134 (17.7%)	265 (17.3%)	0.894
46–55	411 (18.0%)	154 (20.3%)	257 (16.8%)	0.047
56–65	487 (21.3%)	150 (19.7%)	337 (22.1%)	0.230
66–75	390 (17.0%)	125 (16.5%)	265 (17.3%)	0.647
>75	237 (10.4%)	76 (10.0%)	161 (10.5%)	0.757
Education				
Without a degree	52 (2.3%)	33 (4.4%)	19 (1.2%)	0.000
Secondary general school	651 (28.7%)	236 (31.4%)	415 (27.3%)	0.047
Secondary school	984 (43.3%)	295 (39.3%)	689 (45.4%)	0.007
Academic secondary school	318 (14.0%)	118 (15.7%)	200 (13.2%)	0.114
Tertiary education	261 (11.5%)	68 (9.1%)	193 (12.7%)	0.013
Other	4 (0.2%)	1 (0.1%)	3 (0.2%)	1.000
Occupational status				
Full-time employment	1,028 (45.2%)	285 (37.7%)	744 (49.0%)	0.000
Part-time employment	252 (11.1%)	107 (14.1%)	145 (9.5%)	0.001
Unemployed	135 (5.9%)	73 (9.6%)	62 (4.1%)	0.000
Other	860 (37.8%)	292 (38.6%)	568 (37.4%)	0.616
Frequency of unemployment				
0	1,168 (51.7%)	300 (40.2%)	868 (57.6%)	0.000
1	498 (22.1%)	174 (23.3%)	324 (21.2%)	0.337
2	302 (13.4%)	130 (17.4%)	172 (11.4%)	0.000
3	149 (6.6%)	67 (9.0%)	82 (5.4%)	0.002
≥4	140 (6.2%)	75 (10.1%)	65 (4.4%)	0.000
Occupation				
Never been employed	28 (1.2%)	12 (1.6%)	16 (1.1%)	0.360
Blue collar workers	545 (24.1%)	200 (26.8%)	345 (22.7%)	0.039
White collar workers	1,350 (59.6%)	429 (57.4%)	921 (60.7%)	0.147
Civil servants	113 (5.0%)	33 (4.4%)	80 (5.3%)	0.437
Other	228 (10.1%)	73 (9.8%)	155 (10.2%)	0.797
Net household income (in Euro)	2,751.8 (1,566.4)	2,532.5 (1,538.3)	2,859.5 (1,569.4)	0.000
Equalized household income				
≤1,000€	221 (9.9%)	108 (14.6%)	113 (7.5%)	0.000
≤2,000€	1,055 (47.1%)	363 (49.2%)	692 (46.1%)	0.179
≤3,000€	613 (27.3%)	177 (24.0%)	436 (29.0%)	0.014
>3,000€	351 (15.7%)	90 (12.2%)	261 (17.4%)	0.002
Migration background (yes)	267 (11.7%)	118 (15.5%)	149 (9.7%)	0.000
Depression (yes)	166 (7.3%)	120 (15.9%)	46 (3.0%)	0.000

Significant ($p \leq 0.05$) group differences in bold. p-Values were calculated using Pearson's Chi-squared test. Depression according to PHQ-2 cut-off at ≥ 3 .

Looking at the economic burdens, we found a higher risk of unemployment within the high-risk group of 4+ ACEs (OR = 3.99). Having reported four or more ACEs was also highly

associated with having an equalized income of under 1,126€ and current unemployment (OR = 3.19 and OR = 3.75). For individual ACEs, the ratios ranged between OR = 1.70

TABLE 2 Prevalence of combined adverse childhood experiences (ACEs), odds ratios and 95% confidence intervals for depression, income, education, working hours, occupation, and risk of unemployment.

	Total sample	Depression ^a	Equivalentized income ≤1,126€	Lower level of education ^b	Part-time working	Currently unemployed	Blue collar occupation	Higher risk of unemployment ^c
Number of ACEs (N = 2,288)								
0	1,529 (66.8%)	1	1	1	1	1	1	1
1	262 (11.5%)	3.57 [2.14–5.86]	1.56 [1.06–2.26]	0.90 [0.66–1.21]	1.28 [0.83–1.91]	1.55 [0.85–2.66]	0.98 [0.71–1.33]	1.37 [0.90–2.02]
2	138 (6.0%)	4.57 [2.67–8.55]	1.71 [1.03–2.73]	0.80 [0.52–1.19]	2.44 [1.53–3.78]	2.07 [1.01–3.90]	0.85 [0.54–1.30]	1.36 [0.77–2.27]
3	119 (5.2%)	5.74 [3.13–10.13]	2.56 [1.59–4.01]	1.80 [1.22–2.63]	1.38 [0.75–2.36]	2.90 [1.48–5.30]	1.51 [0.99–2.27]	2.02 [1.19–3.28]
≥4	240 (10.5%)	10.20 [86.73–15.55]	3.19 [2.27–4.44]	1.68 [1.26–2.23]	1.52 [1.00–2.25]	3.75 [2.37–5.83]	1.72 [1.28–2.31]	3.99 [2.87–5.52]
ACEs (N = 2,288)								
Emotional abuse	363 (15.9%)	5.21 [3.74–7.25]	2.45 [1.85–3.23]	1.72 [1.35–2.17]	1.39 [0.99–1.92]	2.87 [1.95–4.16]	1.66 [1.30–1.12]	2.81 [2.11–3.71]
Physical abuse	288 (12.6%)	4.53 [3.19–6.39]	3.07 [2.28–4.10]	2.13 [1.65–2.75]	0.97 [0.64–1.42]	3.48 [2.34–5.10]	2.12 [1.62–2.75]	2.56 [1.87–3.46]
Sexual abuse	86 (3.8%)	6.35 [3.82–10.28]	2.61 [1.55–4.25]	1.88 [1.20–2.92]	1.60 [0.85–2.81]	1.95 [0.89–3.80]	0.80 [0.45–1.35]	2.83 [1.70–4.57]
Emotional neglect	283 (12.4%)	5.27 [3.73–7.42]	2.40 [1.76–3.24]	1.28 [0.98–1.67]	1.07 [0.71–1.56]	2.44 [1.59–3.67]	1.47 [1.11–1.93]	2.15 [1.56–2.94]
Physical neglect	107 (4.7%)	4.94 [3.04–7.82]	2.83 [1.67–4.05]	2.19 [1.47–3.25]	1.13 [0.59–1.98]	2.34 [1.22–4.16]	1.80 [1.18–2.69]	3.35 [2.15–5.12]
Parental separation/divorce	324 (14.2%)	2.80 [1.94–3.97]	1.77 [1.30–2.39]	0.84 [0.64–1.10]	1.75 [1.25–2.41]	1.98 [1.28–2.96]	0.99 [0.75–1.31]	2.03 [1.49–2.75]
Witnessing domestic abuse	150 (6.6%)	4.03 [2.59–6.13]	2.72 [1.84–3.97]	1.92 [1.36–2.69]	1.18 [0.70–1.91]	3.49 [2.12–5.55]	1.71 [1.19–2.43]	2.58 [1.72–3.78]
Case of addiction in household	285 (12.5%)	3.68 [2.56–5.23]	2.14 [1.56–2.91]	1.46 [1.12–1.89]	1.84 [1.30–2.57]	3.27 [2.19–4.82]	1.15 [0.86–1.52]	3.10 [2.29–4.17]
Mental illness in household	179 (7.8%)	3.39 [2.21–5.10]	1.70 [1.13–2.49]	0.84 [0.59–1.18]	1.35 [0.84–2.07]	1.64 [0.92–2.76]	0.83 [0.56–1.20]	2.07 [1.40–3.00]
Incarceration of family member	67 (2.9%)	6.03 [3.40–10.32]	3.45 [2.02–5.75]	2.00 [1.21–3.28]	2.01 [1.03–3.63]	3.73 [1.85–6.92]	1.39 [0.80–2.34]	4.45 [2.62–7.40]

Significant (p ≤ 0.05) odds ratios in bold.

^aDepression according to PHQ-2 cut-off at ≥ 3.

^bLower level of education includes graduates from secondary general school (Volks- and Hauptschule).

^cHigher risk of unemployment contains those respondents who were unemployed for at least three times.

(mental illness in household) and OR = 3.45 (incarceration of family member) for the equivalentized income of under 1,126€ and between OR = 1.98 (parental separation or divorce) and OR = 3.73 (incarceration of family member) for current unemployment. Working a part-time job was associated with the incarceration of a family member (OR = 2.01), parental separation or divorce (OR = 1.75) and drug or alcohol abuse in household (OR = 1.84).

Cumulative effect of ACEs on depression and economic burdens

When put in linear structural equation models, we find significant associations between depression and all economic burdens, except for low level of education and part-time working (see Tables 3, 4). The coefficients ranged from $B = 0.017$ ($p = 0.031$, [0.002–0.032]) for working a blue-collar job

TABLE 3 Results of the structural equation models for low income, low level of education and part-time working with 95% confidence intervals.

	Low income (N = 2,232)				Low level of education ^a (N = 2,261)				Part-time working (N = 2,267)			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	CFI = 1.000		CFI = 0.992		CFI = 1.000		CFI = 0.990		CFI = 1.000		CFI = 0.994	
	TLI = 1.000		TLI = 0.945		TLI = 1.000		TLI = 0.933		TLI = 1.000		TLI = 0.960	
	RMSEA = 0.000		RMSEA = 0.029		RMSEA = 0.000		RMSEA = 0.028		RMSEA = 0.000		RMSEA = 0.024	
	SRMR = 0.000		SRMR = 0.008		SRMR = 0.000		SRMR = 0.008		SRMR = 0.000		SRMR = 0.007	
	Coef.	p-Value	Coef.	p-Value	Coef.	p-Value	Coef.	p-Value	Coef.	p-Value	Coef.	p-Value
Number of ACEs												
1 ACE	0.176 (0.055)	0.090	0.033 (0.031)	0.145	-0.024 (-0.017)	0.429	-0.025 (-0.018)	0.410	0.021 (0.021)	0.331	0.024 (0.024)	0.245
	[-0.027 to 0.380]		[-0.012 to 0.078]		[-0.084 to 0.036]		[-0.085 to 0.035]		[-0.021 to 0.062]		[-0.017 to 0.065]	
2 ACEs	0.167 (0.038)	0.227	0.027 (0.018)	0.384	-0.056 (-0.029)	0.173	-0.059 (-0.031)	0.153	0.106 (0.080)	0.000	0.111 (0.084)	0.000
	[-0.104 to 0.437]		[-0.034 to 0.088]		[-0.136 to 0.025]		[-0.139 to 0.022]		[0.050 to 0.161]		[0.056 to 0.165]	
3 ACEs	0.408 (0.089)	0.003	0.092 (0.059)	0.005	0.123 (0.061)	0.005	0.119 (0.059)	0.006	0.025 (0.018)	0.405	0.034 (0.024)	0.246
	[0.138 to 0.677]		[0.028 to 0.156]		[0.038 to 0.208]		[0.034 to 0.204]		[-0.034 to 0.084]		[-0.024 to 0.092]	
4+ ACEs	0.476 (0.141)	0.000	0.108 (0.096)	0.000	0.102 (0.069)	0.002	0.097 (0.066)	0.004	0.034 (0.033)	0.143	0.028 (0.028)	0.213
	[0.272 to 0.679]		[0.058 to 0.158]		[0.037 to 0.168]		[0.031 to 0.163]		[-0.011 to 0.079]		[-0.016 to 0.073]	
Depression	0.135 (0.154)	0.000	0.034 (0.116)	0.000	0.009 (0.023)	0.309	0.009 (0.024)	0.284	0.006 (0.024)	0.293	0.004 (0.014)	0.539
	[0.084 to 0.185]		[0.021 to 0.047]		[-0.008 to 0.026]		[-0.008 to 0.026]		[-0.005 to 0.018]		[-0.008 to 0.015]	
Moderation												
Depression × 1 ACE	0.065 (0.020)	0.000	0.017 (0.015)	0.004	0.004 (0.003)	0.314	0.005 [-0.004 to 0.013]	0.290	0.003 (0.003)	0.299	0.002 (0.002)	0.540
	[0.035 to 0.095]		[0.009 to 0.024]		[-0.004 to 0.013]				[-0.003 to 0.009]		[-0.004 to 0.008]	
Depression × 2 ACEs	0.094 (0.022)	0.000	0.024 (0.016)	0.006	0.006 (0.003)	0.314	0.006 [-0.005 to 0.018]	0.289	0.004 (0.003)	0.299	0.003 (0.002)	0.540
	[0.053 to 0.135]		[0.013 to 0.035]		[-0.006 to 0.018]				[-0.004 to 0.013]		[-0.006 to 0.011]	
Depression × 3 ACEs	0.110 (0.024)	0.000	0.028 (0.018)	0.006	0.007 (0.003)	0.313	0.007 [-0.006 to 0.021]	0.288	0.005 (0.004)	0.298	0.003 (0.002)	0.540
	[0.063 to 0.157]		[0.015 to 0.041]		[-0.007 to 0.021]				[-0.004 to 0.015]		[-0.006 to 0.012]	
Depression × 4+ ACEs	0.174 (0.052)	0.000	0.044 (0.039)	0.009	0.011 (0.008)	0.310	0.012 [-0.010 to 0.033]	0.285	0.008 (0.008)	0.294	0.005 (0.004)	0.539
	[0.107 to 0.240]		[0.027 to 0.061]		[-0.010 to 0.033]				[-0.007 to 0.023]		[-0.010 to 0.019]	
Total effect of ACEs moderated by depression												
Depression × 1 ACE	0.241 (0.075)	0.021	0.050 (0.046)	0.023	-0.020 (-0.014)	0.512	-0.021 [-0.080 to 0.039]	0.496	0.024 (0.024)	0.257	0.026 (0.026)	0.207
	[0.037 to 0.446]		[0.005 to 0.095]		[-0.079 to 0.039]				[-0.017 to 0.065]		[-0.014 to 0.066]	
Depression × 2 ACEs	0.261 (0.060)	0.060	0.051 (0.035)	0.031	-0.050 (-0.026)	0.220	-0.052 [-0.132 to 0.027]	0.198	0.110 (0.083)	0.000	0.113 (0.085)	0.000
	[-0.011 to 0.532]		[-0.010 to 0.111]		[-0.129 to 0.030]				[0.055 to 0.165]		[0.059 to 0.167]	

(Continued)

TABLE 3 Continued

	Low income (N = 2,232)				Low level of education ^a (N = 2,261)				Part-time working (N = 2,267)			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	CFI = 1.000		CFI = 0.992		CFI = 1.000		CFI = 0.990		CFI = 1.000		CFI = 0.994	
	TLI = 1.000		TLI = 0.945		TLI = 1.000		TLI = 0.933		TLI = 1.000		TLI = 0.960	
	RMSEA = 0.000		RMSEA = 0.029		RMSEA = 0.000		RMSEA = 0.028		RMSEA = 0.000		RMSEA = 0.024	
	SRMR = 0.000		SRMR = 0.008		SRMR = 0.000		SRMR = 0.008		SRMR = 0.000		SRMR = 0.007	
	Coef.	p-Value	Coef.	p-Value	Coef.	p-Value	Coef.	p-Value	Coef.	p-Value	Coef.	p-Value
Depression × 3 ACEs	0.518 (0.113)	0.000	0.120 (0.077)	0.032	0.130 (0.064)	0.002	0.126	0.003	0.030 (0.021)	0.311	0.037 (0.026)	0.202
	[0.252 to 0.783]		[0.056 to 0.183]		[0.046 to 0.214]		[0.042 to 0.210]		[-0.028 to 0.089]		[-0.020 to 0.094]	
Depression × 4+ ACEs	0.649 (0.193)	0.000	0.152 (0.134)	0.024	0.114 (0.077)	0.000	0.109	0.001	0.042 (0.041)	0.055	0.033 (0.032)	0.126
	[0.456 to 0.842]		[0.105 to 0.199]		[0.052 to 0.175]		[0.047 to 0.171]		[-0.001 to 0.084]		[-0.009 to 0.075]	
Control variables												
Gender (Ref.: Men)			0.026 (0.038)	0.068			-0.015 (-0.016)	0.433			0.133 (0.211)	0.000
			[-0.002 to 0.054]				[-0.052 to 0.022]				[0.108-0.158]	
Migration background			0.114 (0.106)	0.000			0.047 (0.033)	0.114			-0.003 (-0.004)	0.864
			[0.070 to 0.157]				[-0.011 to 0.105]				[-0.043 to 0.036]	

Significant ($p \leq 0.05$) coefficients in bold.

Standardized coefficient and 95% confidence interval in brackets.

^aLower level of education includes graduated from secondary general school (Volks- and Hauptschule).

TABLE 4 Results of the structural equation models for current unemployment, blue collar employment and higher risk of unemployment with 95% confidence intervals.

	Currently unemployed (N = 2,267)				Blue collar job (N = 2,255)				Higher risk of unemployment ^a (N = 2,249)			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	CFI = 1.000		CFI = 0.994		CFI = 1.000		CFI = 0.994		CFI = 1.000		CFI = 0.991	
	TLI = 1.000		TLI = 0.959		TLI = 1.000		TLI = 0.959		TLI = 1.000		TLI = 0.942	
	RMSEA = 0.000		RMSEA = 0.024		RMSEA = 0.000		RMSEA = 0.029		RMSEA = 0.000		RMSEA = 0.029	
	SRMR = 0.000		SRMR = 0.007		SRMR = 0.000		SRMR = 0.008		SRMR = 0.000		SRMR = 0.008	
	Coef.	p-Value	Coef.	p-Value	Coef.	p-Value	Coef.	p-Value	Coef.	p-Value	Coef.	p-Value
Number of ACEs												
1 ACE	0.006 (0.008)	0.712	0.005 (0.006)	0.771	-0.011 (-0.008)	0.715	-0.019 (-0.014)	0.495	0.016 (0.015)	0.478	0.015 (0.014)	0.494
	[-0.025 to 0.037]		[-0.026 to 0.035]		[-0.067 to 0.046]		[-0.072 to 0.035]		[-0.028 to 0.060]		[-0.028 to 0.059]	
2 ACEs	0.019 (0.019)	0.367	0.016 (0.016)	0.438	-0.032 (-0.018)	0.410	-0.043 (-0.024)	0.239	0.008 (0.006)	0.793	0.004 (0.003)	0.897
	[-0.022 to 0.060]		[-0.025 to 0.057]		[-0.108 to 0.044]		[-0.115 to 0.029]		[-0.051 to 0.066]		[-0.054 to 0.062]	
3 ACEs	0.044 (0.042)	0.049	0.040 (0.037)	0.078	0.073 (0.038)	0.078	0.050 (0.026)	0.204	0.056 (0.037)	0.079	0.050 (0.033)	0.115
	[0.000 to 0.088]		[-0.004 to 0.083]		[-0.008 to 0.154]		[-0.027 to 0.126]		[-0.006 to 0.118]		[-0.012 to 0.112]	
4+ ACEs	0.058 (0.076)	0.001	0.055 (0.072)	0.001	0.097 (0.069)	0.002	0.103 (0.074)	0.001	0.165 (0.151)	0.000	0.155 (0.142)	0.000
	[0.025 to 0.091]		[0.022 to 0.089]		[0.035 to 0.159]		[0.044 to 0.162]		[0.117 to 0.212]		[0.107 to 0.203]	
Depression	0.031 (0.155)	0.000	0.032 (0.159)	0.000	0.010 (0.029)	0.203	0.017 (0.046)	0.031	0.030 (0.107)	0.000	0.031 (0.109)	0.000
	[0.023 to 0.040]		[0.023 to 0.041]		[-0.006 to 0.026]		[0.002 to 0.032]		[0.018 to 0.043]		[0.019 to 0.043]	
Moderation												
Depression × 1 ACE	0.016 (0.021)	0.000	0.016 (0.022)	0.000	0.005 (0.004)	0.211	0.008 (0.006) [0.000	0.040	0.015 (0.015)	0.000	0.016 (0.015)	0.000
	[0.009 to 0.022]		[0.010 to 0.022]		[-0.003 to 0.013]		to 0.016]		[0.008 to 0.023]		[0.008 to 0.023]	
Depression × 2 ACEs	0.022 (0.022)	0.000	0.022 (0.022)	0.000	0.007 (0.004)	0.211	0.011 (0.006)	0.040	0.021 (0.015)	0.000	0.022 (0.015)	0.000
	[0.013 to 0.030]		[0.014 to 0.031]		[-0.004 to 0.018]		[0.001 to 0.022]		[0.011 to 0.032]		[0.011 to 0.032]	

(Continued)

TABLE 4 Continued

	Currently unemployed (N = 2,267)				Blue collar job (N = 2,255)				Higher risk of unemployment ^a (N = 2,249)			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	CFI = 1.000		CFI = 0.994		CFI = 1.000		CFI = 0.994		CFI = 1.000		CFI = 0.991	
	TLI = 1.000		TLI = 0.959		TLI = 1.000		TLI = 0.959		TLI = 1.000		TLI = 0.942	
	RMSEA = 0.000		RMSEA = 0.024		RMSEA = 0.000		RMSEA = 0.029		RMSEA = 0.000		RMSEA = 0.029	
	SRMR = 0.000		SRMR = 0.007		SRMR = 0.000		SRMR = 0.008		SRMR = 0.000		SRMR = 0.008	
	Coef.	p-Value	Coef.	p-Value	Coef.	p-Value	Coef.	p-Value	Coef.	p-Value	Coef.	p-Value
Depression × 3	0.025 (0.024)	0.000	0.026 (0.024)	0.000	0.008 (0.004)	0.209	0.014 (0.007)	0.038	0.025 (0.016)	0.000	0.025 (0.017)	0.000
ACEs	[0.016 to 0.034]		[0.016 to 0.035]		[-0.005 to 0.022]		[0.001 to 0.026]		[0.013 to 0.036]		[0.013 to 0.037]	
Depression × 4+	0.039 (0.051)	0.000	0.040 (0.052)	0.000	0.013 (0.009)	0.205	0.021 (0.015)	0.032	0.039 (0.035)	0.000	0.039 (0.036)	0.000
ACEs	[0.027 to 0.051]		[0.028 to 0.052]		[-0.007 to 0.034]		[0.002 to 0.040]		[0.022 to 0.055]		[0.023 to 0.055]	
Total Effect of ACEs moderated by depression												
Depression × 1	0.021 (0.029)	0.172	0.021 (0.028)	0.189	-0.005 (-0.004)	0.850	-0.010 (-0.008)	0.701	0.031 (0.030)	0.160	0.031 (0.029)	0.165
ACE	[-0.009 to 0.052]		[-0.010 to 0.051]		[-0.062 to 0.051]		[-0.064 to 0.043]		[-0.012 to 0.075]		[-0.013 to 0.074]	
Depression × 2	0.041 (0.041)	0.052	0.038 (0.039)	0.066	-0.025 (-0.014)	0.517	-0.032 (-0.018)	0.382	0.029 (0.021)	0.325	0.025 (0.018)	0.389
ACEs	[-0.000 to 0.082]		[-0.002 to 0.079]		[-0.100 to 0.050]		[-0.103 to 0.039]		[-0.029 to 0.087]		[-0.032 to 0.083]	
Depression × 3	0.069 (0.065)	0.002	0.065 (0.062)	0.003	0.081 (0.042)	0.046	0.063 (0.033)	0.102	0.080 (0.053)	0.011	0.075 (0.050)	0.017
ACEs	[0.025 to 0.113]		[0.022 to 0.109]		[0.001 to 0.161]		[-0.013 to 0.139]		[0.019 to 0.142]		[0.013 to 0.136]	
Depression × 4+	0.097 (0.127)	0.000	0.095 (0.124)	0.000	0.110 (0.079)	0.000	0.124 (0.089)	0.000	0.203 (0.186)	0.000	0.194 (0.178)	0.000
ACEs	[0.065 to 0.129]		[0.063 to 0.127]		[0.051 to 0.168]		[0.068 to 0.180]		[0.158 to 0.248]		[0.149 to 0.239]	
Control variables												
Gender (Ref.: Men)			-0.032 (-0.068)	0.001			-0.278 (-0.325)	0.000			-0.007 (-0.010)	0.610
			[-0.051 to -0.013]				[-0.312 to -0.245]				[-0.034 to 0.020]	
Migration background			0.035 (0.047)	0.022			0.025 (0.019)	0.352			0.081 (0.077)	0.000
			[0.005 to 0.065]				[-0.027 to 0.077]				[0.038 to 0.123]	

Significant ($p \leq 0.05$) coefficients in bold.

Standardized coefficient and 95% confidence interval in brackets.

^aHigher risk of unemployment contains those respondents who were unemployed for at least three times.

to $B = 0.034$ ($p < 0.000$, [0.021–0.047]) for having a low income. Furthermore, both reporting 3 and 4+ ACEs was significantly associated with reporting any economic burden, with an increased effect of 4+ ACEs compared to 3 ACEs. The largest coefficients amongst participants who reported three ACEs were found for low income ($B = 0.092$, $p = 0.005$, [0.028–0.156]) and low level of education ($B = 0.119$, $p = 0.006$, [0.034–0.204]). Working a blue collar or part-time job and experiencing a higher risk of unemployment or being currently unemployed were not significantly associated with reporting three ACEs. The largest coefficients amongst participants who reported four or more ACEs were found for low level of education ($B = 0.097$, $p = 0.004$, [0.031–0.163]), low income ($B = 0.108$, $p < 0.001$, [0.058–0.158]), and higher risk of unemployment ($B = 0.155$, $p < 0.001$, [0.107–0.203]). Only part-time working was not significantly associated with reporting four or more ACEs, but was associated with reporting 2 ACEs ($B = 0.111$, $p < 0.001$, [0.056–0.165]).

The interaction terms between depression and number of ACEs were mostly significant, except for the cases of low level of education and part-time working. We found the largest moderation effects amongst those who reported four or more ACEs, indicating that demonstrating signs of depression amongst this population increased the total effect of number of ACEs by up to $B = 0.044$ (low income, $p = 0.009$, [0.027–0.061]). Additionally, we also found gender effects as well as effects of having a migration background for almost all economic burdens when including gender and migration as control variables. Being a woman decreased the risk of being unemployed ($B = -0.032$, $p = 0.001$, [−0.051 to −0.013]) and working in a blue-collar job ($B = -0.278$, $p < 0.001$, [−0.312 to −0.245]), but increased the risk of working part-time ($B = 0.133$, $p < 0.001$, [0.108–0.158]). Having a migration background increased the risk of being currently unemployed ($B = 0.035$, $p = 0.022$, [0.005–0.065]) and being at greater risk of unemployment in general ($B = 0.081$, $p < 0.001$, [0.038–0.123]), as well as having a lower income ($B = 0.114$, $p < 0.001$, [0.070–0.157]).

Discussion

In this study, we investigated the (co-)occurrence of ACEs and their correlations to negative economic outcomes, such as lower income, lower level of education, type of occupation and unemployment, as well as depression. In total, 33.2% reported at least one ACE, including 10.5% reporting four or more. The most common ACE was emotional abuse, followed by parental separation or divorce. Least common were incarceration of a family member and sexual abuse. These findings were largely in line with other findings of representative studies in Germany, in which the prevalence of child maltreatment ranged from 31.0% (22) to 43.7% (1). The prevalence of adverse childhood experiences mirrored findings from a previous representative cross-sectional study of German samples (1, 2, 37), in which the frequencies for physical and emotional abuse were reported

to be significantly higher and frequencies for sexual abuse were reported significantly lower than those of previous studies (22, 37, 38).

Association with depression and role as moderator

We found that each individual ACE showed a strong association to depression with odds ratios ranging from OR = 2.80 (parental separation) to OR = 6.35 (sexual abuse). These findings were significantly higher than those of, for example, Witt et al. (1), who found (unadjusted) odds ranging from OR = 2.04 (parental separation) to OR = 3.94 (sexual abuse). The relatively high odds for depressive symptoms after experiencing sexual trauma in childhood is a common and widely discussed phenomenon in literature (39, 40). Though, more recent studies conclude, above all, neglect and emotional abuse to have the strongest and the most relevant associations to depression while sexual and physical abuse may be less strongly associated (40). The association between adverse experiences and depression might be result of a higher sensitivity to stress, a heightened emotional vulnerability and engagement with repetitive negative thinking after the experience of adverse events in childhood (13, 14, 16).

We found that having experienced 3 or 4+ ACEs increased the risk for depressive symptoms. This result is in accordance with previous studies indicating an association between cumulative ACEs and negative psychological outcomes (1, 23, 39). Not only were the odds of depression higher amongst those who reported multiple, or more specifically 4+ ACEs, even after controlling for gender and migration background. This might be due to negative metacognitive beliefs resulting from adverse experiences in childhood that are associated with high levels of depression. Researchers have found that a low confidence in one's own memory was associated with low work ability (41). When adjusting in a structural equation model, the significant associations for depression were lowest for working a blue-collar job and highest for being currently unemployed. Depression had no significant association with low level of education and part-time working, indicating that depression, on itself, does not increase the risk of those factors (3).

As for economic burdens and the occurrence of ACEs, we found a generally higher risk of occurrence of economic burdens in one's life the more ACEs the person has experienced, except for people who worked part-time. Respondents who suffered four or more ACEs, for example, were more likely to be at risk of poverty with an equalized income of under 1,126€ and a blue-collar job. Furthermore, they were also more likely to be currently unemployed and to be at greater risk of unemployment, in general. This mirrors results from previous studies (4, 6, 18–22, 42). Additionally, when investigating the moderating effect of depression, we found that almost all

interaction terms were significantly moderating and increasing the effects of number of ACEs on economic burdens. The largest effects were found amongst those who reported four or more ACEs, further cementing the negative cumulative impact of ACEs on adult economic life. Our findings on the relation of ACEs, depression and economic performance in adult life have serious clinical implications: The importance of the role of depression after having experienced childhood adversities on adulthood economic outcomes, it is crucial to be able to identify possible depressive symptoms early in order to induce psychological intervention, such as, for example, metacognitive psychotherapy (14, 43).

The role of gender and migration background

Finally, the role of gender needs to be addressed. We found a lower likelihood for women to be affected by current unemployment or working a blue-collar job compared to men. Instead, we found that women were more likely to live at risk of poverty with an equivalized income of under 1,126€ and to work part-time jobs. This might be due to gender roles in traditional family constellations where women typically work part-time jobs in addition to caring for children while their husband is typically working full-time. This might also explain the lower income and the insignificant results for part-time working in the structural equation models for ACEs.

Additionally, we have to consider migration background as an important factor when investigating economic burdens. Our analysis showed a significant association between having a migration background and an increased risk of being unemployed or being at risk of poverty. As this analysis showed by the increasing moderation effect of depression, this association might be due to the increased risks of depressive symptoms in those with migration background compared to non-migrants (44–46). However, this discrepancy in depression prevalence has been heavily disputed by contradicting findings from other researchers who found no differences between migrants and German natives [see for example (47, 48)]. Self-attribution of being a migrant might also play a role in demonstrating depressive symptoms (48). It also needs to be mentioned that these economic burdens can also be affected by one's own socioeconomic status as a child: A lower socioeconomic status is not only associated with the prevalence of ACEs, it also affects the likelihood of a person having a lower education and, in turn, work a lower paid job (23, 49, 50).

Strengths and limitations

A strength of this study is the large and representative sample size of 2,288 participants. To measure adverse childhood experiences, we used the well-established ACE questionnaire.

This measure has been discussed because of its reliability (since it's a retrospective self-reporting measure) and bias (23). However, the biggest benefit of using the ACE questionnaire is that it leaves little room for misinterpretation with its binary questions. The possibility of false-negative statements due to suppression or concealment out of shame has also been discussed extensively in the literature [see for example Harft (51)]. Furthermore, it is possible that this sample excludes participants who are at a higher risk of experiencing sexual trauma, as previous studies showed higher rates of sexual abuse (52). And finally, as previous research showed, childhood maltreatment can be "both a cause and consequence of poverty" [(23), p. 122], making it difficult to test for a definite causal relationship, especially with cross-sectional data. In the same vein, a high risk of being unemployed and generally being more vulnerable to unemployment when suffering depression has been widely discussed (53, 54). Though, it might also be plausible that unemployed respondents suffer from depressive symptoms because of their unemployment, as evidence from many studies leads to suggest (55, 56).

Data availability statement

The data analyzed in this study is subject to the following licenses/restrictions. The dataset is not publicly available. Requests to access these datasets should be directed at: EB, Elmar.Braehler@medizin.uni-leipzig.de.

Ethics statement

The studies involving human participants were reviewed and approved by the Ethics Committee of the Medical Department of the University of Leipzig (Ref. No. 474/20-ek). Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

Author contributions

EB, JF, CS, and MB were involved in the study design. JP performed the statistical analysis and wrote the manuscript. A-CS, EB, MB, JF, and CS provided ideas as well as guidance and critical feedback to the final version of the manuscript. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The burdens of poverty during the COVID-19 pandemic

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Background: Individuals living at-risk-of-poverty have an increased risk of poor mental health. The pandemic and its societal impacts might have negative effects especially on this group widening the gap between rich and poor and also exacerbate gender gaps, which in turn might impact social cohesion.

Aim: The objective of this longitudinal study was to determine if people living at-risk-of-poverty were more vulnerable to economic and psychosocial impacts of the pandemic and showed poorer mental health. Moreover, gender differences were analyzed.

Method: We drew data from a sample of $N = 10,250$ respondents of two time points (T1 starting from October 2020, T2 starting from March 2021) of the Gutenberg COVID-19 Study. We tested for differences between people living at-risk-of-poverty and more affluent respondents regarding economic impacts, psychosocial stressors, as well as depressiveness, anxiety and loneliness, by comparing mean and distributional differences. To test for significant discrepancy, we opted for chi-square- and t-tests.

Results: The analysis sample comprised $N = 8,100$ individuals of which 4,2% could be classified as living at-risk-of-poverty. 23% of respondents living at-risk-of-poverty had a decrease in income since the beginning of the pandemic—twice as many as those not living at-risk-of-poverty, who reported more often an increase in income. Less affluent individuals reported a decrease in working hours, while more affluent people reported an increase. Between our survey time points, we found a significant decrease in these economic impacts. Gender differences for economic changes were only found for more affluent women who worked more hours with no change in income. Less affluent respondents were more impacted by psychosocial stressors, depressiveness, anxiety, and loneliness. Gender differences were found particularly with regard to care responsibilities.

Discussion: Our results indicate a widening in the gap between the rich and the poor at the beginning of the pandemic. Gender differences concerning economic changes affect more affluent women, but women in both income

groups are more burdened by care responsibilities, which might indicate a heightened resurgence of gender role in times of crisis. This increase in inequality might have impacted social cohesion.

KEYWORDS

SARS-CoV-2, COVID-19 pandemic, poverty, economic burden, psychological stress

Introduction

Although the coronavirus disease 2019 (COVID-19) pandemic constitutes a health-related crisis, it rapidly became clear that this could also dovetail with a social and economic crisis, particularly for already vulnerable individuals. Poverty is an important risk factor for poor physical and mental health. Even before the COVID-19 pandemic, people with a low income had a higher vulnerability to suffer from chronic diseases and mental health problems (Aue et al., 2016).

As the measures taken by governments around the world to combat the spread of the COVID-19 pandemic changed daily life and work tremendously, numerous jobs were lost and social welfare institutions suspended their help temporarily (Brodeur et al., 2021). The probability to become a person at-risk-of-poverty [60 % of the median net equivalized income of all households in a country (Eurostat, n.d)] grew during this time (Brodeur et al., 2021). However, previous studies mainly focused on social inequity (education, income, areas of living) as risk factor to get infected with the virus. As for mental health impacts during the pandemic, longitudinal studies using samples of the general population found mainly slight increases in depressiveness, anxiety, and loneliness during the pandemic (Peters et al., 2020; Pierce et al., 2020; Kivi et al., 2021; Kwong et al., 2021). Reviews and meta-analyses confirmed small but significant negative effects on mental health symptoms of anxiety and depression (Kunzler et al., 2021; Prati and Mancini, 2021). Effects for loneliness, general distress, negative affect, and suicide risk were not significant (Prati and Mancini, 2021; Ernst et al., 2022). Some studies identified lower socioeconomic status, unemployment, being female, pre-existing mental conditions, chronic diseases, increased exposure to infection, and being younger as risk factors for poor mental health (Daly et al., 2020; Peters et al., 2020; Santabàrbara et al., 2020; Breslau et al., 2021; Fancourt et al., 2021; Kunzler et al., 2021; Kwong et al., 2021; Niedzwiedz et al., 2021; Benatov et al., 2022; Bonati et al., 2022; Saeed et al., 2022). Low education or income, female gender, young age, having a long-term medical condition, or a history of mental illness were identified as risk factors for loneliness during the pandemic (Bu et al., 2020; Varga et al., 2021; Jaspal and Breakwell, 2022). Most of those risk factors are also known as potential predictors for poverty, indicating an association between the two pandemic impacts.

Already before the pandemic, associations between inequality or poverty, social cohesion, and mental health have been found. We understand social cohesion to consist of three main dimensions: social relations, identification, and orientation toward a common good (Schiefer and van der Noll, 2017). Kawachi and Kennedy (1997) argued that an increase in income inequality leads to an increase in the concentration of poverty and affluence, which in turn might lead to population health impacts due to deteriorating social cohesion. They stated that this might be because inequality negatively impacts crime rates, economic productivity, and the functioning of a representative democracy and thus society and social cohesion themselves. Furthermore, Fone et al. (2007) provided evidence that poor mental health outcomes were associated with neighborhood income deprivation and low social cohesion, indicating a joint effect. In a later study, Fone et al. (2014) also found evidence for social cohesion acting as a mediator between living in deprived neighborhoods and change in mental health, significantly decreasing the effect of poverty on mental health if social cohesion is heightened. Hong et al. (2014) came to similar results for a Latino community. Furthermore, Chuang et al. (2013) found that respondents who lived in countries with higher social inclusion, social diversity, as well as social capital (which they argued to be aspects of social cohesion) were more likely to demonstrate good general health, with the effect of the social cohesion aspects outweighing even individual-level characteristics.

Scholars highlighted the association of social cohesion and mental health during the pandemic. Kim (2020) suggested that emotional and psychological stress due to uncertainty, not being able to participate in social life, and not being in control in times of a global pandemic might have reduced social cohesion, canceling out its protective nature. Silveira et al. (2022) also found that during the first lockdown the levels of social cohesion, as well as adaptive coping, decreased while psychological vulnerability increased, indicating a higher likelihood of negative mental health impact. Focusing on deprived and marginalized communities, studies also showed that social cohesion within these groups had been negatively impacted during the pandemic (Friedkin, 2004; Fone et al., 2007; Greene et al., 2015; Kim, 2020; Borkowska and Laurence, 2021; Silveira et al., 2022). Therefore, we suggest that growing economic inequality and a negative impact on mental health

might also indicate a decline in social cohesion during the pandemic.

This study examined whether people at-risk-of-poverty were more likely to suffer from negative economic and employment impacts of the pandemic as well as from mental health burdens regarding depressiveness, anxiety, and loneliness. The aim of this paper was to investigate possible differences in depressiveness, anxiety, and loneliness between people living at risk of poverty and those above the threshold for poverty over the span of the pandemic. Potential stressors such as job loss, loss of working hours, and loss of income are considered. We also focused on the interaction with gender differences. Respondents of a large, population-based, prospective, observational single-center cohort study were examined. This paper contributes to the important issue of how the COVID-19 pandemic affects the mental health and social and economic situation of people at-risk- of-poverty and thereby might impact social cohesion in Germany.

The following questions were addressed:

1. Are persons at-risk-of-poverty more vulnerable to
 - a. negative economic and employment impacts, and
 - b. poor mental health during the COVID-19 pandemic?
2. Are there differences between women and men in less and more affluent individuals?
3. Are there differences between the two survey time points regarding the wealth and mental health gap?

Methods

Study design and sample

We draw our data from the Gutenberg COVID-19 Study (GCS), a population-representative, prospective cohort study. The study sample consists of $N = 8,121$ individuals of the Gutenberg Health Study [GHS, (Wild et al., 2012)] and $N = 2,129$ newly recruited individuals. The GHS is a large-scale population-based cohort study that focuses on a multitude of diseases, such as cardiovascular diseases, cancer, ophthalmological diseases, metabolic diseases, diseases of the immune system, and mental diseases and aims to improve the individual risk predication for diseases. After the outbreak of SARS-CoV-2, the respondents of the Gutenberg Health Study were invited to participate in the Gutenberg COVID-19 Study. The overall objective of the GCS is to comprehensively and systematically investigate the epidemiology of the COVID-19 pandemic in the population.

The recruitment process of the GHS started in 2007 in the target area of Mainz/Mainz-Bingen by drawing random samples from the resident's registration office. Women and men aged

between 35 and 74 were invited to participate. The sample was stratified by gender, age, and place of residence (Mainz/Mainz-Bingen). Individuals who were mentally or physically unable to visit the study center as well as individuals with low proficiency in the German language were excluded from the study. For the GCS, 2129 additional respondents aged 25–44 years were additionally recruited. In total, the GCS cohort includes 10,250 individuals aged 25 to 88 years. In the context of the GCS, two visits at the study center took place, during which a computer-assisted personal interview and sequential sampling of biomaterial were performed. Questionnaires were sent prior to the visit at the study site. The first GCS data collection took place from October 2020 to April 2021 (T1), the second from March 2021 to June 2021 (T2). For the present study, we included respondents with available data at both measurement time points and household incomes. In addition, participants who are currently pursuing education were excluded from this study since it is difficult to compare full-time students with people who are already in the working sector. This left us with a sample of $N = 8,100$ individuals.

The requirements of Good Clinical Practice (GCP), Good Epidemiological Practice (GEP), and the ethical standards of the Declaration of Helsinki were considered during the study's design, implementation, and analysis. Furthermore, the Federal Data Protection Act's requirements were implemented. The Ethics Committee of the Rhineland-Palatinate Medical Association, as well as the Data Protection Officer of the Johannes Gutenberg University Hospital Mainz assessed all study-relevant documentation for the Gutenberg Health Study and the Gutenberg COVID-19 Study and gave a positive vote. The data protection commissioner of Rhineland-Palatinate approved the drawing of the sample *via* the citizens' registration offices.

Measures

In order to measure mental health impacts, we used depressiveness, anxiety, loneliness, and psychosocial stress as indicators. For each time point, depressiveness was assessed using the self-administered Patient Health Questionnaire (PHQ-9) depression scale (Löwe et al., 2004). On a 4-point scale (0 = 'not at all' to 3 = 'nearly every day') respondents answered questions regarding their level of interest, eating habits, self-perception, capacity to concentrate and sleep, energy levels, feeling down or depressed, and thoughts of suicide. The items were summed up to create a composite score. Anxiety was measured using the GAD-2 questionnaire (Spitzer et al., 2006; Kroenke et al., 2007), a two-item screening instrument that asks respondents to score how much they have been impacted by uneasiness, anxiety, and the inability to stop or control their worrying on a scale of 0 ('not at all') to 3 ('nearly every day'). The two items were used as a sum score. The three-item loneliness

scale (Hughes et al., 2004), shortened from the 20-item Revised UCLA Loneliness Scale [R-UCLA, (Russell et al., 1980)], was used to measure loneliness. Respondents were asked to rate on a scale ranging from 0 (“never”) to 4 (“always”) how often they lacked companionship, how often felt like left out, and how often they felt isolated from others. Furthermore, we included the psychosocial stress screening instrument PHQ-Stress (Gräfe et al., 2004). PHQ-Stress was measured by asking respondents to rate how much stressors such as worrying about health and looks, financial strain, and dreams about traumatic experiences has impacted them on a scale from 0 (“not bothered at all”) to 2 (“bothered a lot”).

We considered gender and being at-risk-of-poverty as main predictors. Being at-risk-of-poverty was estimated using relative poverty defined by the European Union Statistics on Income and Living Conditions [EU-SILC, (Eurostat, n.d)]. According to EU-SILC, a person is at risk of poverty if their net equivalized income is under 60% of the median net equivalized income of all households. Net equivalized income was calculated by dividing the total monthly net income of a household by a weighted household size. The first adult was weighed by a factor of 1,0, every additional household member over the age of 14 years of age was weighed by adding a factor of 0,5, and every child under the age of 14 years of age was weighed by adding a factor of 0,3 to the weighing scale. Since the median in 2019 was at 1,790€, we estimated a net equivalized of under 1,074€ to be the threshold of living at-risk-of-poverty.

Additionally, we inquired about a change in a person’s income (no; yes, it has increased; yes, it has decreased; no answer) and about a change in a person’s occupation (no; reduction of working hours; increase of working hours; job loss) in order to estimate the economic impact. At T1, respondents were asked about changes since the beginning of the pandemic. At T2, they were asked about changes since the last time they were surveyed. All measurement instruments were collected using a computer-assisted personal interview (CAPI).

Statistical analysis

We first identified respondents who could be classified to live at-risk-of-poverty. We then performed a descriptive analysis to identify sociodemographic differences between people living at-risk-of-poverty and those who do not live at-risk-of-poverty. Secondly, we tested for further differences between the two groups and between the time points regarding economic impacts, psychosocial stressors, as well as depressiveness, anxiety and loneliness, by comparing mean and distributional differences. We opted for chi-square and *t*-tests in order to identify significant differences between the groups. A $p < 0.05$ indicated a significant discrepancy. All analyzing and testing was performed using R (Version 1.3.1093, packages: car, carData, dplyr, psych, sandwich, jtools, lm.beta).

Results

Sample characteristics

Within our sample ($N = 8,100$), 342 individuals were classified as individuals living at-risk-of-poverty according to the EU-SILC (see Table 1). In comparison to the rest of the participants, this population was significantly younger (more people between 25 and 34). In addition, less affluent individuals held lower education degrees, were significantly more often unemployed or worked irregularly, were more often single or lived apart from their partner, had more children under the age of 18 living in the same household, and had more frequently a migration background. We found no difference in COVID-infection between the two groups.

Economic impacts

Individual economic and employment changes since the beginning of the COVID-19 pandemic for less and more affluent women and men are shown in Table 2. For changes in income, we found that individuals that were more affluent reported significantly more often no changes or higher income while less affluent persons reported significantly more often less income during the pandemic. This was found for both measurement times. Considering changes in employment, the analysis showed for the first time point (T1) that respondents living at-risk-of-poverty reported more frequently to have had no changes in working hours or worked fewer hours since the start of the pandemic. More affluent respondents, however, reported working more hours than before the pandemic. Only the difference that less affluent individuals reported fewer working hours during the pandemic remained significant at the second measurement point (T2). At T1, less affluent respondents reported significantly more often that they have received either short-time compensation or financial aid. At T2, less affluent respondents reported more often to have started a new job. When we looked at the changes over time, we found that the reported frequencies of respondents earning less income and working less significantly decreased for all respondents (see Appendix 1). Additionally, more affluent respondents stated less frequently that they worked more and had more income since the first survey time point.

When considering the interaction between risk-at-poverty and gender, we found that there were no significant differences in any economic impact between less affluent men and women. Between more affluent men and women, we found significant differences. Women reported to work more hours since the beginning of the pandemic at T1 and T2. At T2, more affluent men reported more often an increased income since the start

TABLE 1 Socio-demographic characteristics of respondents living and not living at-risk-of-poverty.

	Sample (<i>N</i> = 8,100) <i>N</i> (%)	At-risk-of-poverty (<i>N</i> = 342) <i>N</i> (%)	Not at-risk-of-poverty (<i>N</i> = 7,758) <i>N</i> (%)	<i>p</i>
Gender				
Male	4,024 (49.7%)	154 (45.0%)	3,870 (49.9%)	0.089
Female	4,076 (50.3%)	188 (55.0%)	3,888 (50.1%)	
Age				
25–34	792 (9.8%)	52 (15.2%)	740 (9.5%)	0.001
35–44	1,221 (15.1%)	41 (12.0%)	1,180 (15.2%)	0.120
45–54	1,462 (18.0%)	61 (17.8%)	1,401 (18.1%)	0.974
55–64	1,868 (23.1%)	85 (24.9%)	1,783 (23.0%)	0.460
65–75	1,632 (20.1%)	63 (18.4%)	1,569 (20.2%)	0.456
75+	1,125 (13.9%)	40 (11.7%)	1,085 (14.0%)	0.263
Education				
No/ other degree	19 (0.3%)	3 (1.2%)	16 (0.3%)	0.039
Secondary general School	1,571 (23.8%)	109 (41.9%)	1,462 (23.1%)	0.000
Secondary School	1,676 (25.4%)	63 (24.2%)	1,613 (25.5%)	0.704
Academic secondary school	3,325 (50.5%)	85 (32.7%)	3,240 (51.2%)	0.000
Further education				
No/ other degree	225 (3.4%)	25 (9.6%)	200 (3.2%)	0.000
Vocational school	3,647 (55.3%)	181 (69.9%)	3,466 (54.7%)	0.000
University degree	2,719 (41.3%)	54 (20.8%)	2,665 (42.1%)	0.000
Employment status				
No current occupation	2,535 (33.2%)	127 (40.8%)	2,408 (32.8%)	0.004
Irregular	461 (6.0%)	56 (18.0%)	405 (5.5%)	0.000
Part-time	1,368 (17.9%)	64 (20.6%)	1,304 (17.8%)	0.236
Fulltime	3,280 (42.9%)	64 (20.6%)	3,216 (43.9%)	0.000
Partnership				
Single	1,223 (18.3%)	109 (39.1%)	1,114 (17.4%)	0.000
Partnership (living apart)	522 (7.8%)	58 (20.8%)	464 (7.2%)	0.000
Partnership (living together)	4,948 (73.9%)	112 (40.1%)	4,836 (75.4%)	0.000
Children under 18 in household (yes)	1,913 (23.6%)	85 (24.9%)	1,828 (23.6%)	0.628
Mean number of children under 18 in household	0.42 (0.94)	0.73 (2.12)	0.41 (0.85)	0.000
Migration background (yes)	1,703 (21.0%)	93 (27.4%)	1,610 (20.8%)	0.004
COVID-infection				
T1	293 (3.6%)	9 (2.6%)	284 (3.7%)	0.399
T2	404 (5.0%)	21 (6.1%)	383 (4.9%)	0.382

We used chi-square tests of independence to test for significant differences between the groups. Significant *p*-values in bold. T1 = COVID-Infection at survey time point 1. T2 = COVID-Infection at survey time point 2.

of the pandemic while more affluent women reported more frequently no changes in income, but they have started more often a new job. As for changes between the time points, we, again, observed that, less respondents stated that they worked less and had a decreased income. Here, we also found that more affluent respondents, regardless of gender, reported significantly less that they worked more and had a higher income since the beginning of the pandemic.

Psychosocial impacts

Differences in psychosocial stress (PHQ-stress) since the beginning of the COVID-19 pandemic between less and more affluent women and men are shown in Table 3. In general, people living at-risk-of-poverty reported a higher sum score of stress for both time points. On a single item level, financial, social, and traumatic concerns were higher for less affluent

TABLE 2 Changes in income and employment during the COVID-19 pandemic for men and women living and not living at-risk-of-poverty (N = 8,100).

	At-risk-of-poverty													
	T1				T2									
	Sample (N = 8,100) M (SD)	At-risk-of-poverty (N = 342) M (SD)	Not at-risk-of-poverty (N = 7,758) M (SD)	p	Sample (N = 8,100) M (SD)	At-risk-of-poverty (N = 342) M (SD)	Not at-risk-of-poverty (N = 7,758) M (SD)	p						
Change in personal income during pandemic														
No	5,964 (74.7%)	233 (68.7%)	5,731 (75.0%)	0.012	6,135 (80.3%)	228 (73.6%)	5,907 (80.7%)	0.003						
Yes, more	931 (11.7%)	19 (5.6%)	912 (11.9%)	0.001	678 (8.9%)	15 (4.8%)	663 (9.0%)	0.014						
Yes, less	954 (11.9%)	78 (23.0%)	876 (11.5%)	0.000	601 (7.9%)	50 (16.1%)	551 (7.5%)	0.000						
Change in working hours/occupation														
No	1,864 (23.0%)	102 (29.8%)	1,762 (22.7%)	0.003	3,484 (43.0%)	131 (38.3%)	3,353 (43.2%)	0.082						
Yes, working less	553 (6.8%)	35 (10.2%)	518 (6.7%)	0.015	149 (1.8%)	14 (4.1%)	135 (1.7%)	0.003						
Yes, working more	648 (8.0%)	17 (5.0%)	631 (8.1%)	0.045	449 (5.6%)	19 (5.6%)	430 (5.6%)	1.000						
Yes, I got a new job	100 (1.2%)	4 (1.2%)	96 (1.2%)	1.000	80 (1.0%)	8 (2.3%)	72 (0.9%)	0.021						
Yes, I lost my job	23 (0.3%)	3 (0.9%)	20 (0.3%)	0.112	10 (0.1%)	2 (0.6%)	8 (0.1%)	0.090						
Yes, I received short-time compensation	123 (1.5%)	11 (3.2%)	112 (1.4%)	0.016	58 (0.7%)	1 (0.3%)	57 (0.7%)	0.534						
Yes, I received financial aid	17 (0.2%)	3 (0.9%)	14 (0.2%)	0.031	8 (0.1%)	1 (0.3%)	7 (0.1%)	0.775						
At-risk-of-poverty x gender														
	T1						T2							
	Sample (N = 8,100) M (SD)	At-risk-of-poverty		p	Not at-risk-of-poverty		p	Sample N = 8,100 M (SD)	At-risk-of-poverty		p	Not at-risk-of-poverty		p
		Men (N = 154) M (SD)	Women (N = 188) M (SD)		Men (N = 3,870) M (SD)	Women (N = 3,888) M (SD)			Men (N = 154) M (SD)	Women (N = 188) M (SD)		Men (N = 3,870) M (SD)	Women (N = 3,888) M (SD)	
Change in personal income during pandemic														
No	5,964 (74.7%)	106 (68.8%)	127 (68.7%)	1.000	2,859 (74.8%)	2,872 (75.2%)	0.721	6,135 (80.3%)	106 (76.3%)	122 (71.3%)	0.397	2,914 (79.6%)	2,993 (81.7%)	0.019
Yes, more	931 (11.7%)	10 (6.5%)	9 (4.9%)	0.680	476 (12.5%)	436 (11.4%)	0.171	678 (8.9%)	7 (5.0%)	8 (4.7%)	1.000	392 (10.7%)	271 (7.4%)	0.000
Yes, less	954 (11.9%)	35 (22.7%)	43 (23.2%)	1.000	441 (11.5%)	435 (11.4%)	0.864	601 (7.9%)	21 (15.1%)	29 (17.0%)	0.775	278 (7.6%)	273 (7.5%)	0.865
Change in working hours/occupation														
No	1,864 (23.0%)	54 (35.1%)	48 (25.5%)	0.072	927 (24.0%)	835 (21.5%)	0.010	3,484 (43.0%)	65 (42.2%)	66 (35.1%)	0.218	1,738 (44.9%)	1,615 (41.5%)	0.003
Yes, working less	553 (6.8%)	16 (10.4%)	19 (10.1%)	1.000	263 (6.8%)	255 (6.6%)	0.709	149 (1.8%)	6 (3.9%)	8 (4.3%)	1.000	61 (1.6%)	74 (1.9%)	0.310
Yes, working more	648 (8.0%)	4 (2.6%)	13 (6.9%)	0.115	268 (6.9%)	363 (9.3%)	0.000	449 (5.6%)	6 (3.9%)	13 (6.9%)	0.329	173 (4.5%)	257 (6.6%)	0.000
Yes, I got a new job	100 (1.2%)	1 (0.6%)	3 (1.6%)	0.761	39 (1.0%)	57 (1.5%)	0.085	80 (1.0%)	3 (2.0%)	5 (2.7%)	0.941	26 (0.7%)	46 (1.2%)	0.026
Yes, I lost my job	23 (0.3%)	1 (0.6%)	2 (1.1%)	1.000	9 (0.2%)	11 (0.3%)	0.831	10 (0.1%)	1 (0.7%)	1 (0.5%)	1.000	3 (0.0%)	5 (0.1%)	0.728
Yes, I received short-time compensation	123 (1.5%)	4 (2.6%)	7 (3.7%)	0.780	59 (1.5%)	53 (1.4%)	0.617	58 (0.7%)	0 (0.0%)	1 (0.5%)	1.000	30 (0.8%)	27 (0.7%)	0.777
Yes, I received financial aid	17 (0.2%)	0 (0.0%)	3 (1.6%)	0.321	5 (0.1%)	9 (0.2%)	0.427	8 (0.1%)	1 (0.7%)	0 (0.0%)	0.920	4 (0.1%)	3 (0.1%)	0.995

We used chi-square tests of independence to test for significant differences between the groups. Significant p-values in bold. Respondents who chose to not respond to the questions and data that was otherwise missing was excluded from this table, which is why the data of the columns might not add up to 100%.

TABLE 3 Stressors and burdens of men and women living and not living at-risk-of-poverty (N = 8,100).

	At-risk-of-poverty							
	T1				T2			
	Sample (N = 8,100)	At-risk-of-poverty (N = 342)	Not at-risk-of-poverty (N = 7,758)	p	Sample (N = 8,100)	At-risk-of-poverty (N = 342)	Not at-risk-of-poverty (N = 7,758)	p
	M (SD)	M (SD)	M (SD)		M (SD)	M (SD)	M (SD)	
Sum score PHQ stress	4.01 (3.17)	4.66 (3.47)	3.98 (3.15)	0.000	4.23 (3.34)	4.96 (3.58)	4.20 (3.33)	0.000
Concern about health	0.71 (0.65)	0.76 (0.70)	0.71 (0.65)	0.147	0.73 (0.67)	0.83 (0.68)	0.73 (0.67)	0.008
Concern about weight and looks	0.59 (0.67)	0.66 (0.67)	0.59 (0.67)	0.053	0.70 (0.69)	0.77 (0.71)	0.70 (0.69)	0.073
Low or no sexual desire or pleasure during intercourse	0.49 (0.65)	0.42 (0.62)	0.50 (0.65)	0.042	0.55 (0.67)	0.53 (0.66)	0.55 (0.67)	0.540
Problems with spouse or (life) partner	0.38 (0.59)	0.44 (0.65)	0.38 (0.59)	0.075	0.41 (0.61)	0.44 (0.60)	0.41 (0.61)	0.385
Burden of caring for children, parents or other family members	0.45 (0.66)	0.46 (0.65)	0.45 (0.66)	0.804	0.43 (0.65)	0.46 (0.67)	0.43 (0.65)	0.343
Stress at work or in school	0.59 (0.73)	0.54 (0.72)	0.59 (0.73)	0.181	0.58 (0.72)	0.54 (0.72)	0.58 (0.72)	0.293
Financial issues or concerns	0.23 (0.49)	0.66 (0.72)	0.21 (0.47)	0.000	0.22 (0.48)	0.65 (0.71)	0.20 (0.46)	0.000
Having no one to talk to about issues	0.24 (0.49)	0.34 (0.55)	0.24 (0.48)	0.000	0.36 (0.59)	0.47 (0.66)	0.36 (0.59)	0.001
Something bad that happened recently	0.26 (0.57)	0.36 (0.65)	0.26 (0.56)	0.002	0.26 (0.57)	0.32 (0.61)	0.26 (0.57)	0.055
Thoughts or dreams about bad events ^a	0.23 (0.50)	0.34 (0.61)	0.22 (0.50)	0.000	0.21 (0.48)	0.33 (0.57)	0.20 (0.48)	0.000

	At-risk-of-poverty x gender													
	T1						T2							
	Sample (N = 8,100)	At-risk-of-poverty		Not at-risk-of-poverty		p	Sample N = 8,100	At-risk-of-poverty		Not at-risk-of-poverty		p		
	M (SD)	Men (N = 154)	Women (N = 188)	Men (N = 3,870)	Women (N = 3,888)		M (SD)	Men (N = 154)	Women (N = 188)	Men (N = 3,870)	Women (N = 3,888)			
Sum score PHQ stress	4.01 (3.17)	4.27 (3.54)	4.98 (3.40)	0.061	3.59 (2.96)	4.37 (3.29)	0.000	4.23 (3.34)	4.58 (3.47)	5.27 (3.64)	0.077	3.70 (3.17)	4.69 (3.40)	0.000
Concern about health	0.71 (0.65)	0.71 (0.69)	0.80 (0.71)	0.247	0.65 (0.63)	0.77 (0.66)	0.000	0.73 (0.67)	0.81 (0.70)	0.84 (0.66)	0.736	0.66 (0.65)	0.80 (0.68)	0.000
Concern about weight and looks	0.59 (0.67)	0.51 (0.63)	0.79 (0.68)	0.000	0.49 (0.62)	0.70 (0.70)	0.000	0.70 (0.69)	0.64 (0.69)	0.87 (0.71)	0.003	0.57 (0.64)	0.83 (0.71)	0.000
Low or no sexual desire or pleasure during intercourse	0.49 (0.65)	0.50 (0.64)	0.35 (0.59)	0.030	0.49 (0.64)	0.51 (0.66)	0.093	0.55 (0.67)	0.56 (0.66)	0.49 (0.66)	0.368	0.53 (0.66)	0.57 (0.68)	0.004
Problems with spouse or (life) partner	0.38 (0.59)	0.44 (0.65)	0.44 (0.65)	0.925	0.36 (0.57)	0.40 (0.61)	0.004	0.41 (0.61)	0.40 (0.58)	0.48 (0.62)	0.240	0.38 (0.59)	0.44 (0.63)	0.000
Burden of caring for children, parents or other family members	0.45 (0.66)	0.40 (0.65)	0.51 (0.65)	0.160	0.39 (0.61)	0.52 (0.70)	0.000	0.43 (0.65)	0.37 (0.61)	0.55 (0.71)	0.017	0.36 (0.60)	0.50 (0.70)	0.000
Stress at work or in school	0.59 (0.73)	0.42 (0.65)	0.62 (0.76)	0.017	0.54 (0.69)	0.65 (0.76)	0.000	0.58 (0.72)	0.47 (0.69)	0.59 (0.75)	0.164	0.52 (0.69)	0.65 (0.75)	0.000
Financial issues or concerns	0.23 (0.49)	0.59 (0.69)	0.72 (0.74)	0.121	0.20 (0.46)	0.22 (0.48)	0.090	0.22 (0.48)	0.56 (0.64)	0.73 (0.75)	0.026	0.20 (0.45)	0.21 (0.47)	0.150
Having no one to talk to about issues	0.24 (0.49)	0.32 (0.52)	0.36 (0.57)	0.513	0.23 (0.47)	0.25 (0.50)	0.079	0.36 (0.59)	0.42 (0.63)	0.51 (0.68)	0.260	0.30 (0.54)	0.41 (0.63)	0.000
Something bad that happened recently	0.26 (0.57)	0.33 (0.61)	0.37 (0.68)	0.589	0.21 (0.51)	0.30 (0.61)	0.000	0.26 (0.57)	0.32 (0.61)	0.32 (0.62)	0.967	0.21 (0.51)	0.30 (0.62)	0.000
Thoughts or dreams about bad events ^a	0.23 (0.50)	0.37 (0.64)	0.31 (0.58)	0.333	0.17 (0.44)	0.27 (0.54)	0.000	0.21 (0.48)	0.27 (0.50)	0.38 (0.62)	0.088	0.17 (0.44)	0.23 (0.51)	0.000

We used t-tests to test for significant differences between the groups. Significant p-values in bold. ^a "Thoughts or dreams about bad events from the past, e.g., the destruction of one's own home, physical violence or a sexual act under duress."

individuals for both time points. The only stressor that was more common amongst the more affluent respondents was a low or non-existing sexual desire at T1. Interestingly, at T1, less affluent individuals reported significantly more worrying about something bad that had happened recently, but this difference was no longer significant at T2. However, at T2, less affluent individuals reported significantly more worries about their health. When looking at significant differences between the time points, we found that while more affluent respondents reported significant increases in most items, less affluent respondents only reported increases for concerns for weight and looks as well as for lower libido and having no one to talk to (see [Appendix 2](#)).

When also considering gender, significant differences were found regarding men and women living at-risk-of-poverty at T1 with women reporting more concerns about weight and looks and more stress at work. Men reported more concerns about low sexual desire. At T2, less affluent women reported more concerns about weight and looks, the burden of caring for children, parents or other family members, and their financial situation. Amongst the more affluent respondents at T1, we found that women reported to be more bothered by almost all psychosocial stressors, except for low sexual desire, financial concerns and having no one to talk to. At the second time point, all stressors were reported as more bothersome by more affluent women compared to more affluent men, with the sole exception of financial concerns. Looking at the differences between the time points, we observed that both genders of the less affluent groups reported increases in concern about weight and looks as well as having no one to talk to, with less affluent men also reporting an increase in lower sexual desire compared to the previous time point. For more affluent men we found significant increases for concern about weight and looks, sexual desire, problems with their partner and not having anyone to talk to and significant decreases for care burden. More affluent women reported significant increases in almost all items except care burden, worrying about financial issues and the trauma items.

Depressiveness, anxiety, and loneliness

[Table 4](#) shows the differences in depressiveness, anxiety, and loneliness between the time points for more and less affluent men and women. We observed significant group differences between less and more affluent respondents for all outcomes at both time points with less affluent respondents reporting significantly higher scores. When tested for changes between the two time points, we found that less affluent respondents reported a significant decrease in depressiveness, no significant change in anxiety, and a significant increase in loneliness. Respondents that were more affluent did not demonstrate any significant changes between the time points

for depressiveness and anxiety, but a significant increase in loneliness.

When taking the interaction of living-at-risk-of-poverty and gender into account, less affluent women only reported significantly higher scores in depressiveness at T1 than less affluent men, while more affluent women reported significantly higher scores in depressiveness, anxiety, and loneliness at both time points compared to more affluent men. Additionally, only more affluent men underwent a significant decrease in depressiveness between the time points. For loneliness, all groups reported significantly higher scores at the second time point, except for women living at-risk-of-poverty.

Discussion

In this study, we found that respondents living at-risk-of-poverty were not only more likely to experience negative changes in their income and work situation, but also reported significantly higher scores for psychosocial stress, depressiveness, anxiety, and loneliness. At the beginning of the pandemic, they more often received financial compensation than more affluent individuals. Regardless of income, women were found to be more burdened than men. For less affluent individuals, women reported more financial concerns and burdens of caring for children and significant others than men. For more affluent individuals, women reported more negative economic and employment changes during the pandemic, more concerns about numerous psychosocial stress factors, and higher symptom burden in depressiveness, anxiety, and loneliness than men. These results might imply an increase in wealth and gender inequality, which, in turn, might indicate a decline in social cohesion at the beginning of the pandemic. We also found that, between the time points, both the economic impacts as well as the mental health impacts seemed to have declines, implying an incline of social cohesion.

Economic impact

We observed that less affluent respondents reported significantly more often a reduced income and less working hours since the start of the pandemic while more affluent respondents either did not have any change in income or had an increase both in income and in working hours. Prior studies had similar findings, with [Adams-Prassl et al. \(2020\)](#) concluding that the reduction of working hours or even job loss was more prevalent amongst temporary workers and low-skilled workers which are generally part of the poorest population group. [Martinez-Bravo and Sanz \(2021\)](#) also reported a large discrepancy between the richest and the poorest quintile: The income of the poorest decreased much more than the income of the richest. Additionally, [Findling et al. \(2021\)](#) found that low-

TABLE 4 | Depressiveness, anxiety, and loneliness of men and women living and not living at-risk-of-poverty ($N = 8,100$).

	T1			T2									
	At-risk-of-poverty ($N = 342$)	Not at-risk-of-poverty ($N = 7,758$)	<i>p</i>	At-risk-of-poverty ($N = 342$)	Not at-risk-of-poverty ($N = 7,758$)	<i>p</i>							
	M (SD)	M (SD)		M (SD)	M (SD)								
Depressiveness	5.14 (4.45)	4.31 (3.84)	0.000	5.04 (4.77)	4.23 (3.94)	0.000							
Anxiety	0.94 (1.25)	0.74 (1.06)	0.000	1.01 (1.28)	0.74 (1.10)	0.000							
Loneliness	3.91 (2.71)	3.57 (2.43)	0.012	4.27 (2.76)	3.92 (2.55)	0.014							
Respondents at-risk-of-poverty over time			Respondents not at-risk-of-poverty over time										
	T1	T2	<i>p</i>	T1	T2	<i>p</i>							
	M (SD)	M (SD)		M (SD)	M (SD)								
Depressiveness	5.14 (4.45)	5.04 (4.77)	0.007	4.31 (3.84)	4.23 (3.94)	0.580							
Anxiety	0.94 (1.25)	1.01 (1.28)	0.922	0.74 (1.06)	0.74 (1.10)	0.564							
Loneliness	3.91 (2.71)	4.27 (2.76)	0.000	3.57 (2.43)	3.92 (2.55)	0.008							
Respondents at-risk-of-poverty						Respondents not at-risk-of-poverty							
	T1		<i>p</i>	T2		<i>p</i>	T1		<i>p</i>	T2		<i>p</i>	
	Men ($N = 154$)	Women ($N = 188$)		Men ($N = 154$)	Women ($N = 188$)		Men ($N = 3,870$)	Women ($N = 3,888$)		Men ($N = 3,870$)	Women ($N = 3,888$)		
	M (SD)	M (SD)		M (SD)	M (SD)		M (SD)	M (SD)		M (SD)	M (SD)		
Depressiveness	4.47 (4.10)	5.69 (4.66)	0.012	4.58 (4.13)	5.42 (5.22)	0.104	3.68 (3.55)	4.94 (4.00)	0.000	3.56 (3.70)	4.89 (4.05)	0.000	
Anxiety	0.88 (1.22)	1.04 (1.28)	0.242	0.94 (1.16)	1.06 (1.38)	0.403	0.57 (0.95)	0.90 (1.13)	0.000	0.57 (0.96)	0.91 (1.19)	0.000	
Loneliness	3.64 (3.86)	4.12 (2.81)	0.103	4.12 (2.67)	4.39 (2.83)	0.368	3.27 (2.30)	3.86 (2.52)	0.000	3.60 (2.38)	4.25 (2.66)	0.000	
Respondents at-risk-of-poverty						Respondents not at-risk-of-poverty							
	T1	T2	<i>p</i>	T1	T2	<i>p</i>	T1	T2	<i>p</i>	T1	T2	<i>p</i>	
	M (SD)	M (SD)		M (SD)	M (SD)		M (SD)	M (SD)		M (SD)	M (SD)		M (SD)
	M (SD)	M (SD)		M (SD)	M (SD)		M (SD)	M (SD)		M (SD)	M (SD)		M (SD)
Depressiveness	4.47 (4.10)	4.58 (4.13)	0.682	5.69 (4.66)	5.42 (5.22)	0.306	3.68 (3.55)	3.56 (3.70)	0.005	4.94 (4.00)	4.89 (4.05)	0.245	
Anxiety	0.88 (1.22)	0.94 (1.16)	0.525	1.04 (1.28)	1.06 (1.38)	0.844	0.57 (0.95)	0.57 (0.96)	0.540	0.90 (1.13)	0.91 (1.19)	0.540	
Loneliness	3.64 (3.86)	4.12 (2.67)	0.027	4.12 (2.81)	4.39 (2.83)	0.131	3.27 (2.30)	3.60 (2.38)	0.000	3.86 (2.52)	4.25 (2.66)	0.000	

We used t-tests to test for significant differences between the groups. Significant *p*-values in bold.

to moderate income households suffered and continue to suffer the most financially under the pandemic. Households who had savings before the pandemic reported to have lost those. This might indicate a widening of the wealth gap. In addition to this, our analysis showed that less affluent individuals got more likely financial support only at the beginning of the pandemic and were more likely to start a new job at the four-month follow-up. This might be due to loss of income in the current employment and the wish or need to work full-time without reduced working hours or income. The same was true for more affluent women reporting more often to have started a new job at T2. Probably, they were also unsatisfied with their current work situation as they worked more without increases in income. When testing for significant differences between the time points, we also found a decrease in less affluent respondents reporting to work and earn less. We also observed a decrease in more affluent respondents working and earning more. This might indicate a slow closure of the wealth gap to pre-pandemic levels.

Interestingly we found no significant discrepancies in economic impacts between men and women living at-risk-of-poverty. However, amongst more affluent respondents, we found a gender gap with more affluent women working more hours but more affluent men earning more money. These results contradict the findings of previous studies: Women, in general but in particular mothers, were found to either work less than men or to have lost their jobs during the pandemic due to childcare responsibilities, especially during the beginning of the pandemic (Carli, 2020; Alon et al., 2021; Collins et al., 2021; Hipp and Bünning, 2021; Reichelt et al., 2021). A possible explanation for this result might be that the women in our sample were more likely to work in secure occupations that were also more compatible with childcare (e.g., home office), or that they had a social network helping with childcare. The fact that more affluent men more often reported an increase in income might indicate a widening of the gender gap. Other studies found that women had a larger decrease in income than men. They were also reported to recover much slower financially than men, which might be due to care work responsibilities at home (Martinez-Bravo and Sanz, 2021).

Psychosocial impact

We found that people living at-risk-of-poverty were generally more affected by psychosocial burdens. For less affluent people, financial, social, and traumatic concerns were of particular interest. This result was to be expected as there is growing literature on children growing up in poverty having a higher risk of being exposed to severe stressors and multiple traumatic events such as witnessing violent events, food insecurity, or maternal depression, which are additionally heightened by the dangerous living environments of urban poverty (Kiser et al., 2008; Briggs-Gowan et al., 2010;

Collins et al., 2010). The heightened financial concern amongst less affluent respondents might be due to a lack of financial buffers and resources as well as the inability to cut costs in order to save up money in financially stressful times, which were found predominantly among low-income people (Gennetian and Shafir, 2015). Factors associated with urban poverty have been shown to also be associated with higher risk of family dysfunction and impacted interpersonal relationships, which might explain why less affluent respondents reported significantly more to be burdened by social concerns (Collins et al., 2010). Poverty-related stress has been reported to impact interpersonal relationships in the family (Grant et al., 2003; Conger and Donnellan, 2007). Moreover, these social concerns might also be related to the type of jobs less affluent people usually work: People working in supermarkets experienced a whole new type of stress since they were suddenly considered an “essential” worker, which might have left them with a burden of responsibility and societal stress.

Additionally, they were constantly exposed to a heightened risk of infection. Interestingly, less affluent individuals reported more health concerns at T2, suggesting a greater focus on the pandemic and its health effects with a time lag. Only at T1 did less affluent persons report that something bad happened recently which might be due to loss of income or working hours which was not significant at T2 anymore. Studies during the pandemic found that parents and their adolescent children suffered from a significant increase in psychosocial stress, which was even significantly higher amongst mothers, possibly due to care responsibilities and a generally higher vulnerability to stress disorders (Connor et al., 2020; Paschke et al., 2021). This might also explain why, in our study, less affluent women reported more frequently concerns about caring for children, parents, or other family members, as well as about financial issues at T2.

More affluent women reported more concerns than affluent men in almost all psychosocial stress factors, only did they not report financial worries. Interestingly, while all respondents demonstrated an increase in having no one to talk to during the pandemic, only more affluent women reported significantly more to be burdened with having no one to talk to at T2 compared to their male counterparts. This might indicate the impacts of contact reduction due to social distancing and pandemic measures which might have led to more loneliness. Previous studies showed that working women in particular reported significantly more often to be burdened by multiple co-existing strains such as strains within their occupation, strains in caregiving, but also household chore strains (Kramer and Kipnis, 1995) and are more affected by psychiatric morbidity because of caregiving (Covinsky et al., 2003). The COVID-19 pandemic seems to have reinforced these gender roles after the closure of schools and nurseries, which might have led to an increase in stress among women who are trying to incorporate these role traits into their self-identity (Connor et al., 2020).

Families had to take care of their children while also continuing to work. This care work, however, was largely the responsibility of women (Power, 2020).

Depressiveness, anxiety, and loneliness

We found that less affluent people, who were more affected by the abovementioned stressors, were also generally more affected by depressiveness, anxiety, and loneliness at both time points. Even before the outbreak of COVID-19, members of low-income families experienced a wide array of stressors such as crowding, noise, family turmoil, and early childhood separation, which resulted in psychological distress, impacted well-being, a self-regulation deficit, and maladaptive coping strategies (Evans and English, 2002; Grant et al., 2003; Conger and Donnellan, 2007). Additionally, studies performed during the COVID-19 pandemic highlighted a vicious circle of poverty: Stressors associated with poverty, such as food insecurity and limited access to mental health services, were found to be exacerbated by the stress resulting from the COVID-19 pandemic (Gabrielli and Lund, 2020). Also, multiple studies have identified low income to be a major risk factor for poor mental health outcomes during the pandemic (Daly et al., 2020; Peters et al., 2020; Santabárbara et al., 2020; Breslau et al., 2021; Fancourt et al., 2021; Kunzler et al., 2021; Niedzwiedz et al., 2021; Benatov et al., 2022; Bonati et al., 2022; Ernst et al., 2022). Although we found a significant decrease in depressiveness between time points among less affluent respondents, the symptom burden generally remained higher than among more affluent individuals. Additionally, more affluent men showed a significant decrease in depressiveness. Previous longitudinal research, too, has reported slight increases at the beginning of the pandemic and decreases in the course of the pandemic for anxiety and depression symptoms (Peters et al., 2020; Kivi et al., 2021; Kunzler et al., 2021; Prati and Mancini, 2021). Therefore, it is unsurprising that we found decreases in depressiveness.

We also observed significant increases in loneliness for both less and more affluent respondents over time. This might be associated with the significant increase in all respondents reporting to not having anyone to talk to. When additionally testing for gender differences, we found that all groups with the exception of women living at-risk-of-poverty reported significantly increased levels of loneliness over time. Previous research showed that loneliness was an important health factor that increased significantly during the pandemic, especially among females and people of low income (Bu et al., 2020; Varga et al., 2021; Jaspal and Breakwell, 2022). The insignificant increase in our study for less affluent women might be due to this group's low number of cases.

Implications for social cohesion

When we put these results into the framework of social cohesion, we suggest that the widening of the wealth gap and the gender gap indicate a decline in social cohesion (Kawachi and Kennedy, 1997). Additionally, as Wilkinson and Pickett (2010) argued, due to the rises in inequality, a person's status becomes an increasingly important factor of one's identity, which in turn increases status competition, social evaluation, and status anxiety. People further down the social ladder become more disadvantaged in regards to this status competition since they gathered fewer material and immaterial resources such as high income, good jobs, houses, cars, as well as social connections, which might increase their social standing. To prove this theory, the author's presented evidence from WHO data that linked anxiety to inequality. As mentioned, we were able to find a rise in inequality as well as significantly higher symptom burdens amongst less affluent respondents, which appears to confirm Wilkinson and Pickett's results.

Between the two time points, however, we found a significant decrease in less affluent respondents that stated to working less and having a reduced income. This might indicate the beginning of a decrease in the wealth gap to pre-pandemic levels and imply that social cohesion also increased back to pre-pandemic levels, while inequality decreased. To add to that, while we found initially heightened scores for depression and anxiety, we found either no significant changes or even a decline over the course of our study. This might indicate that, because social cohesion possesses a protective quality for mental health, it might have increased between the two time points (Friedkin, 2004; Fone et al., 2007; Greene et al., 2015; Borkowska and Laurence, 2021). This corroborates the findings by Silveira et al. (2022) as well as Borkowska and Laurence (2021) who found that the levels of social cohesion declined during lockdown (end of 2020), but increased after governmental measures were lifted (beginning of 2021).

Because of these results, we suggest a further reduction of the income disparities between less and more affluent people by the means government issued financial aid as well as a strengthening of social cohesion in deprived neighborhoods in order to address mental health impacts following the pandemic.

Limitations

The most important limitation is the small number of cases per group, so the effects described are probably rather small. The 4.2% proportion of people living at-risk-of-poverty within our sample is an underrepresentation of the actual percentage amongst the German population [18.7% in 2018, (Statista, 2022)]. Though it must be noted that the Federal Statistical Office took respondents of all ages into account while our sample was only compromised of individuals aged 25 to 88.

Nevertheless, those respondents within our sample that can be categorized as living at-risk-of-poverty match the characteristics found within the German population: they were mostly younger people (aged 18–24, in our sample 25–34), people living alone, working part-time, irregularly or were unemployed, as well as people with a low to moderate level of education, with a migration background and individuals who were single parents that live on the threshold of poverty (Statistisches Bundesamt, 2021). Additionally, the two survey time points might have been too close in time to one another, which might have influenced some results and rendered some otherwise significant factors insignificant. Finally, though a large body of research suggested that poverty and inequality in general have an impact on social cohesion, the direction of the causality might also be the other way around. A low social cohesion might increase inequality due to lack of trust, mutual tolerance, and discrimination, which can manifest itself in the absence of or discrimination in the distribution of governmental aid, such as welfare and subvention programs. Consequently, more longitudinal research needs to be done concerning the causal association between social cohesion, mental health, and poverty.

Data availability statement

The datasets presented in this article are not readily available because the datasets presented in this article are not allowed to be publicly shared according to regulations for data protection (EU General Data Protection Regulations). The data used during the current study are exclusively available at the local database. Requests to access the datasets should be directed to PW, Philipp.Wild@unimedizin-mainz.de.

Ethics statement

The studies involving human participants were reviewed and approved by the Ethics Committee of the Rhineland-Palatinate Medical Association as well as the Data Protection Officer of the Johannes Gutenberg University Hospital Mainz. The patients/participants provided their written informed consent to participate in this study.

Author contributions

JP: idea, statistical analysis, and manuscript. NH: manuscript and critical feedback. RB, PW, NP, TM, JK, KL, and MB: study

design and critical feedback. All authors contributed to the article and approved the submitted version.

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Conflict of interest

This paper is part of the author JP's cumulative PhD.

The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fsoc.2022.995318/full#supplementary-material>

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7 General discussion

7.1 Summary of the studies

The first study, entitled „Childhood Maltreatment, Depression, and Their Link to Adult Economic Burdens“, explored the long-term effects of childhood maltreatment on mental health, particularly depression, and how this impacts economic outcomes in adulthood. We examined how early adverse experiences, such as abuse or neglect, increased the risk of developing depression, which can, in turn, affect educational and employment opportunities, leading to economic struggles later in life. Key findings of the study were (1) early childhood trauma has been found to be linked to higher depressive symptom load in adolescence or adulthood. (2) Most adverse childhood experiences were linked to lower educational attainment, reduced income, and higher rates of unemployment in adulthood. Additionally, (3) the interaction of depressiveness and childhood trauma was associated with a higher likelihood of a reduced income and unemployment. The study emphasizes that the negative effects of childhood maltreatment and subsequent depression can perpetuate cycles of poverty across generations, as individuals who struggle economically may provide less stability for their own children.

The second study, entitled “The Burdens of Poverty”, investigated if and how people at-risk-of-poverty were more affected by distress, loneliness, and economic losses during the COVID-19 pandemic. We found that people already suffering from financial strain were more likely affected by income losses and decreases in working hours than more affluent people. Furthermore, we observed that less affluent people were more affected by depressiveness, anxiety, loneliness, and psychosocial stress. Most affected were less affluent women. These results, overall, indicate a widening in the wealth gap and emphasize the importance of the role of poverty in mental health research.

7.2 Integration in the theoretical framework and broader research context

Studies have consistently provided evidence for both social causation and social selection theories, demonstrating that the relationship between socioeconomic status and mental health is complex and multifaceted. The applicability of these theories often depends on the specific mental illness in question, suggesting that different conditions may interact with socioeconomic factors in unique ways. In this section, the two studies presented in this dissertation will be discussed within the framework of social causation and social selection, which themselves are embedded in the embodiment framework, integrating them into the broader research context.

Study 1 revealed that adverse childhood experiences are linked not only to an increased risk of developing depressive symptoms in adulthood but also to a higher likelihood of facing economic hardship later in life. This connection between ACEs, depression, and financial difficulties creates a negative feedback loop, where individuals with a history of trauma are more prone to both low income and unemployment. Moreover, the more trauma an individual experienced, the greater their risk of economic instability. These findings align with previous research (Boden et al., 2007; Currie & Spatz Widom, 2010; Fahy et al., 2017; Felitti et al., 1998; Harkonmaki et al., 2007; Liu et al., 2013; C. Lund & Cois, 2018; Witt et al., 2017). Individuals who experienced adverse events may internalize stress through biological mechanisms, particularly when childhood adversity affects neurodevelopment (Barboza Solís et al., 2015; Castagné et al., 2018). ACEs are associated with heightened stress responses and anxiety, partly due to the dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis, a key regulator of stress (Kalmakis et al., 2015; Molcrani, 1997; Raymond et al., 2018). Chronic HPA axis dysregulation is linked to long-term psychological issues, including a higher risk of anxiety, depression, and mood disorders (Heim & Nemeroff, 2001, 2001). The distress caused by trauma may impair cognitive, social, and emotional functioning, which can hinder job performance, reduce confidence, and limit aspirations for higher-earning opportunities (Deady et al., 2022; Gotlib & Joormann, 2010; Hakulinen et al., 2019; Jain et al., 2013; Lerner & Henke, 2008; Mall et al., 2015; Mojtabai et al., 2015). Additionally, individuals that experienced trauma often struggle with self-esteem and confidence, further complicating their ability to pursue financial stability (Ozdemir & Sahin, 2020; Sharac et al., 2010). These dynamics support social selection theory, which suggests that individuals with mental health issues are more likely to experience downward social mobility, pushing them into lower socioeconomic strata (Dohrenwend et al., 1992). Poor mental health can impair functioning in multiple life domains – such as employment, education, and relationships – making it harder for individuals to secure stable jobs, pursue education, or maintain supportive social networks, all of which are essential for economic stability.

This financial instability can, in turn, generate new problems and increase exposure to stressors. In Study 2, individuals at-risk-of-poverty were found to be significantly more affected by traumatic stress and financial concerns than their more affluent counterparts. This aligns with previous research linking poverty to heightened psychosocial, traumatic, and financial stress (Briggs-Gowan et al., 2010; K. Collins et al., 2010, 2010; Conger & Donnellan, 2007; Evans

& English, 2002; Gennetian & Shafir, 2015; Kiser et al., 2008). Moreover, this group also displayed higher levels of depressive symptoms, anxiety, and loneliness, highlighting the profound impact of socioeconomic disparities on mental health. These results reflect earlier findings that identify low income as a major risk factor for poorer mental health outcomes (Benatov et al., 2022; Bonati et al., 2022; Breslau et al., 2021; Daly et al., 2020; Ernst et al., 2022; Fancourt et al., 2021; Kunzler et al., 2021; Niedzwiedz et al., 2021; Peters et al., 2020; Santabárbara et al., 2021). As noted, less affluent individuals are particularly vulnerable to stressors like financial instability, substandard housing, and domestic violence, all of which were amplified during the pandemic (Ahmadabadi et al., 2020; Morganti et al., 2022; Newton et al., 2022; Riva et al., 2022). Job losses led to even greater financial hardship, while confinement to overcrowded or unsafe homes increased the likelihood of domestic violence and strained family dynamics (Eurostat, 2020; Piquero et al., 2021; Wilson et al., 2020). Over time, individuals could have adapted to these stressors, but this adaptation could have led to the deterioration in mental health, including anxiety and depression. Unlike wealthier individuals, who typically have better access to resources and coping mechanisms, the less affluent may find it harder to recover from this cumulative stress, further deteriorating their psychological well-being. These findings support social causation theory, which suggests that socioeconomic status and environmental conditions are key determinants of mental health and overall well-being. Notably, even after their mental distress symptoms subsided, individuals with lower socioeconomic status continued to experience a heavier burden than the general population. This persistent disadvantage further underscores the deep-rooted connection between poverty and mental illness.

Finally, both studies uncovered important insights regarding the intersectionality of poverty and gender: Study 2, for example, revealed that less affluent women were particularly vulnerable to financial concerns and mental health outcomes. Previous research has demonstrated that loneliness, especially during the pandemic, emerged as a critical health issue among females and individuals from low-income backgrounds (Bu et al., 2020; Jaspal & Breakwell, 2022; Varga et al., 2021). Moreover, Study 1 found that women were more likely to be affected by a heightened risk of poverty or working part-time jobs. This might be due to gender roles in traditional family constellations where women typically work part-time jobs in addition to caring for children while their husband is typically working full-time (Mazei et al., 2023). This intersectional perspective underscores how sex and gender differently influence mental health and economic burdens, with certain populations, such as women, facing greater vulnerability

to stressors like financial hardship. These findings emphasize the need for targeted interventions that address not only the complex relationship between poverty and mental health but also gender-specific impacts. Tackling these compounded challenges is crucial for improving mental well-being in disadvantaged groups.

7.3 Strengths and Limitations

A key strength of this dissertation is the large sample sizes used in both studies. Study 1 utilized a representative sample comprising 2,288 respondents, while the longitudinal GCS sample in Study 2 involved 8,100 participants. These sample sizes enhance the statistical power and robustness of the findings. However, while this dissertation presents several valuable insights on the associations between poverty and mental health and uses two very large samples, it is important to acknowledge the limitations that may have impacted the outcomes of the studies.

Firstly, both of the studies in this dissertation made use of self-reported questionnaires to measure mental health outcomes as well as adverse childhood experiences (ACEs). These types of questionnaires may introduce potential biases such as the *social desirability bias* or the *recall bias*. Social desirability bias refers to the fact that participants may respond in ways they believe are more socially acceptable or favorable, rather than disclosing about their real feelings and experiences (Graeff, 2005; Latkin et al., 2017). This is especially relevant for questions about ACEs and mental health outcomes, where individuals may underreport negative experiences and mental distress due to shame or stigma (Corrigan, 2000; Sickel et al., 2014, 2019). The ACEs questionnaire, in particular, also introduces the potential of a recall bias as the respondents were asked about past experiences in their childhoods. Here, they have to rely on memory, which may lead to inaccuracies in recalling past events, particularly when the events occurred many years prior or if they are connected to trauma (Prince, 2012).

Additionally, a persistent problem in intersectional research on the gender poverty gap is the measurement of poverty. Household income is most commonly used to calculate the at-risk-of-poverty rate, which was also applied in both presented studies. However, this measure does not take into account economic gender inequalities (Corsi et al., 2016; Ponthieux & Meurs, 2015). One study (Corsi et al., 2016) evaluated the household-based risk-of-poverty-rate and compared it to the individualized financial dependency rate (FDR) using data from the European Union Statistics on Income and Living Conditions (EU-SILC) from the years 2007 to 2012. The study found that the gender pay gap is significantly higher when looking at the FDR. The researchers

suggest to collect data on individual income to appropriately assess women's and men's risk of poverty as well as their financial dependency on their partner.

Another limitation of this dissertation was posed in Study 2 – the potential of a presence of *selection bias*. In longitudinal research, there is a tendency for participants who continue to be part of a study over the span of years or even decades to differ significantly from those who usually drop out at some point. Typically, those who continue to participate are more likely to be better educated, have higher incomes and are generally healthier (Lissner et al., 2003; Wolke et al., 2009). This introduces selection bias, as the sample may no longer represent the broader population; more disadvantaged groups, who might be most affected by the outcomes, being particularly underrepresented. This could skew the results, affecting the generalizability of the findings. However, this limitation in Study 2 may be counterbalanced by the use of a representative data in Study 1. That being said, Study 1 relies solely on cross-sectional data, meaning that it does not capture longitudinal associations or the direction of the effect. The question of whether the observed associations reflect social selection (i.e., people with mental health issues are more likely to experience poverty) or social causation (i.e., poverty leads to mental health problems) remains largely unanswered; the data can only give us hints on the presence of social selection without giving us information on the presence of social causation.

This adds to the overall limitation of the studies presented in this dissertation: While this dissertation provides valuable insights into the association between poverty and mental health, it does not offer longitudinal evidence spanning several years or even decades. Such data would be necessary to fully investigate the bidirectional nature of the relationship between poverty and mental health, as well as the interplay of social selection and social causation effects. Long-term studies are essential to investigate the complex dynamics at play.

7.4 Future directions

Even though this dissertation provides valuable new insights into the poverty-mental illness relationship, some research areas warrant further exploration. Firstly, as pointed out in the limitations section, more longitudinal research is needed to better understand the bidirectional dynamics of social causation and social selection, especially how they interact over the course of an individual's life. These types of studies would certainly help to understand better which of the two influencing factors – poverty or mental health – predominates at which stage of life and under which conditions (i.e., which mental illness, which poverty-associated factor).

Second, as explored in the discussion, it would certainly be valuable to further investigate other social determinants as additional contributors to the poverty-mental illness relationship, such as gender, but also race, ethnicity, or geographic location. This intersectional approach might advance our understanding of this complex relationship better and aid us investigate how these factors can amplify the effects of poverty and mental illness. Furthermore, this approach might also help make better targeted interventions.

This leads us to the last, more practical implication regarding future directions: Interventions. Research has repeatedly shown that targeted interventions that specifically consider the poverty-mental illness cycle, such as cash transfers and pharmacological or psychological treatments, were successful in alleviating individuals suffering from either poverty or mental illness, helping them to potentially break out of this viscous cycle. For example, studies have shown that cash transfers increased happiness while reducing depression, stress, as well as worries (Haushofer & Shapiro, 2016, 2018). Another study (Banerjee et al., 2015), provided its participants with training, savings incentives, temporary cash support, as well as a better access to health care. Not only did the researchers find an increase in financial assets three years later, relieving the participants of their financial strain, they also found an increase in psychological well-being and a decrease in mental distress (Banerjee et al., 2015). Programs with similar approaches have come so similar results (Bandiera et al., 2017). Regarding the impact of mental health on poverty, a meta-analysis that investigated the effect of a multitude of interventions to treat mental illness and their impact on labor supply found that overall productivity went up when a mental illness was treated (C. Lund et al., 2018).

8 References

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9 Appendix

Appendix 1 Changes in income and employment during the COVID-19 pandemic for men and women living and not living at-risk-of-poverty over time (N = 8,100).

At-risk-of-poverty over time												
At-risk-of-poverty (N = 342)						Not at-risk-of-poverty (N = 7,758)						
	T1		T2		p	T1		T2		p		
Change in personal income during pandemic												
No	233 (68.7%)		228 (73.6%)		0.026	5,731 (75.0%)		5,907 (80.7%)		0.000		
Yes, more	19 (5.6%)		15 (4.8%)		0.670	912 (11.9%)		663 (9.0%)		0.000		
Yes, less	78 (23.0%)		50 (16.1%)		0.000	876 (11.5%)		551 (7.5%)		0.000		
Change in working hours/occupation												
No	102 (29.8%)		131 (38.3%)		0.007	1,762 (22.7%)		3,353 (43.2%)		0.000		
Yes, working less	35 (10.2%)		14 (4.1%)		0.000	518 (6.7%)		135 (1.7%)		0.000		
Yes, working more	17 (5.0%)		19 (5.6%)		0.684	631 (8.1%)		430 (5.6%)		0.000		
Yes, I got a new job	4 (1.2%)		8 (2.3%)		0.206	96 (1.2%)		72 (0.9%)		0.056		
Yes, I lost my job	3 (0.9%)		2 (0.6%)		NA	20 (0.3%)		8 (0.1%)		NA		
Yes, I received short-time compensation	11 (3.2%)		1 (0.3%)		NA	112 (1.4%)		57 (0.7%)		NA		
Yes, I received financial aid	3 (0.9%)		1 (0.3%)		0.318	14 (0.2%)		7 (0.1%)		0.127		
At-risk-of-poverty x gender over time												
At-risk-of-poverty (N = 342)						Not at-risk-of-poverty (N = 7,758)						
	Men (N = 154)			Women (N = 188)			Men (N = 3,870)			Women (N = 3,888)		
	T1	T2	p	T1	T2	p	T1	T2	p	T1	T2	p
	N (%)	N (%)		N (%)	N (%)		N (%)	N (%)		N (%)	N (%)	
Change in personal income during pandemic												
No	106 (68.8%)	106 (76.3%)	0.033	127 (68.7%)	122 (71.3%)	0.305	2,859 (74.8%)	2,914 (79.6%)	0.000	2,872 (75.2%)	2,993 (81.7%)	0.000
Yes, more	10 (6.5%)	7 (5.0%)	0.368	9 (4.9%)	8 (4.7%)	0.764	476 (12.5%)	392 (10.7%)	0.002	436 (11.4%)	271 (7.4%)	0.000
Yes, less	35 (22.7%)	21 (15.1%)	0.011	43 (23.2%)	29 (17.0%)	0.009	441 (11.5%)	278 (7.6%)	0.000	435 (11.4%)	273 (7.5%)	0.000
Change in working hours/occupation												
No	54 (35.1%)	65 (42.2%)	0.146	48 (25.5%)	66 (35.1%)	0.018	927 (24.0%)	1,738 (44.9%)	0.000	835 (21.5%)	1,615 (41.5%)	0.000
Yes, working less	16 (10.4%)	6 (3.9%)	0.018	19 (10.1%)	8 (4.3%)	0.007	263 (6.8%)	61 (1.6%)	0.000	255 (6.6%)	74 (1.9%)	0.000
Yes, working more	4 (2.6%)	6 (3.9%)	0.481	13 (6.9%)	13 (6.9%)	1.000	268 (6.9%)	173 (4.5%)	0.000	363 (9.3%)	257 (6.6%)	0.000
Yes, I got a new job	1 (0.6%)	3 (2.0%)	0.319	3 (1.6%)	5 (2.7%)	0.416	39 (1.0%)	26 (0.7%)	0.096	57 (1.5%)	46 (1.2%)	0.264
Yes, I lost my job	1 (0.6%)	1 (0.7%)	NA	2 (1.1%)	1 (0.5%)	NA	9 (0.2%)	3 (0.0%)	NA	11 (0.3%)	5 (0.1%)	NA
Yes, I received short-time compensation	4 (2.6%)	0 (0.0%)	NA	7 (3.7%)	1 (0.5%)	NA	59 (1.5%)	30 (0.8%)	NA	53 (1.4%)	27 (0.7%)	NA
Yes, I received financial aid	0 (0.0%)	1 (0.7%)	0.319	3 (1.6%)	0 (0.0%)	0.083	5 (0.1%)	4 (0.1%)	0.739	9 (0.2%)	3 (0.1%)	0.083

Note. We used chi-square tests of independence to test for significant differences between the time points. Significant p-values in bold.

Appendix 2 Stressors and burdens of men and women living and not living at-risk-of-poverty over time (N = 8,100).

	At-risk-of-poverty over time						Not at-risk-of-poverty (N = 7,758)					
	At-risk-of-poverty (N = 342)			Not at-risk-of-poverty (N = 7,758)			At-risk-of-poverty (N = 342)			Not at-risk-of-poverty (N = 7,758)		
	T1 M (SD)	T2 M (SD)	p	T1 M (SD)	T2 M (SD)	p	T1 M (SD)	T2 M (SD)	p	T1 M (SD)	T2 M (SD)	p
Sum score PHQ stress	4.66 (3.47)	4.96 (3.58)	0.084	3.98 (3.15)	4.20 (3.33)	0.000	4.27 (3.54)	4.58 (3.47)	0.235	4.98 (3.40)	5.27 (3.64)	0.210
Concern about health	0.76 (0.70)	0.83 (0.68)	0.147	0.71 (0.65)	0.73 (0.67)	0.007	0.71 (0.69)	0.81 (0.70)	0.139	0.80 (0.71)	0.84 (0.66)	0.509
Concern about weight and looks	0.66 (0.67)	0.77 (0.71)	0.000	0.59 (0.67)	0.70 (0.69)	0.000	0.51 (0.63)	0.64 (0.69)	0.004	0.79 (0.68)	0.87 (0.71)	0.027
Low or no sexual desire or pleasure during intercourse	0.42 (0.62)	0.53 (0.66)	0.013	0.50 (0.65)	0.55 (0.67)	0.000	0.50 (0.64)	0.56 (0.66)	0.182	0.35 (0.59)	0.49 (0.66)	0.035
Problems with spouse or (life) partner	0.44 (0.65)	0.44 (0.60)	0.933	0.38 (0.59)	0.41 (0.61)	0.000	0.44 (0.65)	0.40 (0.58)	0.619	0.44 (0.65)	0.48 (0.62)	0.565
Burden of caring for children, parents or other family members	0.46 (0.65)	0.46 (0.67)	0.308	0.45 (0.66)	0.43 (0.65)	0.001	0.40 (0.65)	0.37 (0.61)	0.889	0.51 (0.65)	0.55 (0.71)	0.180
Stress at work or in school	0.54 (0.72)	0.54 (0.72)	0.550	0.59 (0.73)	0.58 (0.72)	0.247	0.42 (0.65)	0.47 (0.69)	0.077	0.62 (0.76)	0.59 (0.75)	0.416
Financial issues or concerns	0.66 (0.72)	0.65 (0.71)	0.853	0.21 (0.47)	0.20 (0.46)	0.432	0.59 (0.69)	0.56 (0.64)	0.278	0.72 (0.74)	0.73 (0.75)	0.448
Having no one to talk to about issues	0.34 (0.55)	0.47 (0.66)	0.000	0.24 (0.48)	0.36 (0.59)	0.000	0.32 (0.52)	0.42 (0.63)	0.009	0.36 (0.57)	0.51 (0.68)	0.002
Something bad that happened recently	0.36 (0.65)	0.32 (0.61)	0.545	0.26 (0.56)	0.26 (0.57)	0.885	0.33 (0.61)	0.32 (0.61)	0.730	0.37 (0.68)	0.32 (0.62)	0.617
Thoughts or dreams about bad events ^a	0.34 (0.61)	0.33 (0.57)	0.713	0.22 (0.50)	0.20 (0.48)	0.000	0.37 (0.64)	0.27 (0.50)	0.091	0.31 (0.58)	0.38 (0.62)	0.242

Note. We used chi-square tests of independence to test for significant differences between the time points. Significant p-values in bold. ^a “Thoughts or dreams about bad events from the past, e.g., the destruction of one’s own home, physical violence or a sexual act under duress.

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