INTIMATE PARTNER VIOLENCE AND DEPRESSIVE SYMPTOMS AMONG PREGNANT WOMEN: TRAJECTORIES, CORRELATES, AND IMPACTS

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Intimate Partner Violence and Depressive Symptoms Among Pregnant Women: Trajectories, Correlates, and Impacts

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CERTIFICATE OF ORIGINALITY

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Abstract of dissertation entitled

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Background: Pregnancy is a pivotal stage with significant physical and hormonal changes, making women vulnerable to health and social challenges. Intimate partner violence (IPV) and depressive symptoms worsen these challenges, creating significant health risks for pregnant women. These challenges not only impact women's well-being but also have detrimental effects on the health and welfare of their children and families. However, different women may experience varied transitions over time. It is essential to examine the trajectories of IPV and depressive symptoms, along with their associated factors and impacts on their offspring. This research is essential for the development of effective prevention and intervention strategies.

Methods: This dissertation encompasses a 3-year longitudinal study in Hong Kong aiming to examine trajectories of IPV and depressive symptoms over time, identify their correlates, and explore their impacts on children's biological health. I first

conducted a meta-analysis with 19 studies to determine whether IPV increases or decreases during pregnancy. Additionally, using a 3-year longitudinal dataset, I further examined IPV and depressive symptom trajectories over time, their associated factors, and their mutual influence. Furthermore, differential impacts of IPV and depressive symptom trajectories on children's buccal telomere length (bTL) at the age of 3 were investigated. For data analysis, I conducted trajectory analyses, logistic, and linear regressions.

Results:

a) The meta-analysis revealed pooled prevalence estimates of IPV: 21.2% before pregnancy, 12.8% during pregnancy, and 14.7% after childbirth. While indicating a decrease in IPV during pregnancy, the prevalence after childbirth showed a subsequent increase from 12.8% to 24.0% beyond the first year.
b) Based on the 3-year longitudinal data analysis, not all women experienced the same patterns of change in IPV over time: 11.8% of women suffered from chronic IPV, 20.6% reported decreased IPV, and 67.6% had no IPV.
c) Variations were observed in depressive symptoms: 13.8% had relapsing/remitting depressive symptoms and 86.2% experienced persistent low symptoms.
d) Adverse childhood experiences were risk factors for vulnerable groups (chronic IPV and relapsing/remitting depressive symptoms groups), while higher partner emotional involvement and family support were protective.
e) IPV after childbirth could differentiate distinguish trajectories of depressive symptoms, and depressive symptoms at any period can differentiate different trajectories of IPV.
f) Children whose mothers belonged to the relapsing/remitting depressive symptoms group had a higher likelihood of having shorter bTL, a biomarker of children's health, compared to the low-stable depressive symptoms group.

Conclusion: Pregnancy does not protect women from IPV and depressive symptoms.

Women exhibit diverse patterns of IPV and depressive symptoms, emphasizing the need for tailored intervention programs to address their specific needs. Screening for a history of adversity and providing adequate support can protect women from IPV and depressive symptoms. Lastly, maternal depressive symptoms negatively impact children's biomarkers of health. The findings highlight the significance of screening from pregnancy through the years after childbirth and strengthening collaboration among various sectors to enhance antenatal and postnatal care. Based on the research findings, implications for future research, practice, and policy are discussed, aiming to improve the well-being of pregnant women and their families.

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PUBLICATIONS ARISING FROM THE THESIS

Chen, X. Y., Lo, C. K., Chan, K. L., Leung, W. C., & Ip, P. (2022). Association between childhood exposure to family violence and telomere length: A meta-analysis. *International Journal of Environmental Research and Public Health*, *19* (19), 12151. https://doi.org/10.3390/ijerph191912151

Chen, X. Y., Lo, C. K., Ho, F. K., Leung, W. C., Ip, P., & Chan, K. L. (2022). Changing patterns of intimate partner violence against pregnant women: A three-year longitudinal study. *International Journal of Environmental Research and Public Health*, *19*(21), 14397. https://doi.org/10.3390/ijerph192114397

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CHAPTER 1: INTRODUCTION

1.1 Public health challenges to pregnant women

Public health is dedicated to safeguarding and enhancing the well-being of entire populations. The World Health Organization (WHO) defines health as not merely the absence of disease or infirmity, but as a state of complete physical, mental, and social well-being (WHO, 1948). Within the realm of public health, the health of pregnant women is of great concern due to the unique and vulnerable nature of pregnancy (McCauley et al., 2018). There are several categories of health-related issues that pregnant women commonly face. Firstly, physical-related problems arise due to the biological changes that occur during pregnancy and lactation. These changes encompass hormonal fluctuations, such as the release of estrogen and progesterone, as well as physiological alterations in weight gain, breast enlargement, and the circulatory system (Blount et al., 2021; Moya et al., 2014). Secondly, mental-related problems pose significant implications for maternal health, birth outcomes, and the development of the offspring (Blount et al., 2021). As a result, perinatal mental health concerns have garnered increased attention. Various mental health disorders are prevalent during the perinatal period, including mood disorders (e.g., postnatal blues and perinatal depression), a wide range of anxiety disorders (e.g., obsessive-compulsive disorder, posttraumatic stress disorder, generalized anxiety disorder, panic disorder, and specific phobias), psychotic disorders (e.g., schizophrenia and other psychosis), substance-use disorders (e.g., tobacco, alcohol, opioids, and other illicit drugs), eating disorders, puerperal psychosis, and personality disorders (Howard & Khalifeh, 2020; Paschetta et al., 2014). Lastly, social-related problems exert a significant influence on maternal and neonatal health (Blount et al., 2021; Santos et al., 2021). Among these, intimate partner violence is one of the most critical factors of concern.

This dissertation primarily focuses on maternal depressive symptoms and exposure to IPV, aligning with the call to give more attention to these critical issues in the perinatal period (Ogbonnaya et al., 2013). IPV against women is a prevalent public health

problem and a violation of women's human rights (WHO, 2011). This problem is particularly concerning during the perinatal period when not just one, but two lives are at risk. For instance, women who experience IPV during pregnancy are at an increased risk of preterm birth, low birth weight, or having a small-for-gestational-age infant (Donovan et al., 2016). On the other hand, depressive symptoms are a leading cause of nonfatal health loss (Friedrich, 2017) and contribute significantly to the global burden of disease (WHO, 2021). Depressive symptoms among pregnant women are the most common mental health problem (Sheeba et al., 2019) and are considered a significant global public health issue, particularly affecting women during their childbearing years (WHO, 2021). Maternal depression has been associated with various negative consequences, including maternal suicide, adverse perinatal outcomes, poor maternal-infant bonding, and child mental health problems (Stein et al., 2014). Therefore, addressing maternal depression and IPV in the perinatal period is crucial for promoting the well-being of both mothers and their children.

1.2 Intimate partner violence (IPV) and depressive symptoms among pregnant women

This dissertation aims to investigate the occurrence of IPV and depressive symptoms among pregnant women. Pregnancy is a period of significant physical and psychological changes, which can make women more vulnerable to stressors and mental health issues. IPV, encompassing physical, sexual, or emotional abuse by a current or former partner, is a global concern as previously mentioned. However, studies have produced inconsistent findings regarding whether pregnancy acts as a protective factor against IPV (Al Shidhani et al., 2020; Burch & Gallup, 2004). These discrepancies may be attributed to variations in measurement methods, such as comparing limited periods (e.g., before pregnancy vs. during pregnancy or during pregnancy vs. after childbirth) (Mojahed et al., 2021; Taillieu & Brownridge, 2010). To provide a more definitive answer to the question of whether IPV increases or decreases during pregnancy, it is crucial to examine IPV data across multiple periods, including pre-pregnancy, during pregnancy, and after childbirth. Conducting a comprehensive

investigation into changes in IPV throughout the perinatal period is essential for accurately estimating its prevalence (Chan et al., 2021). Without such comparisons, it is challenging to determine whether IPV prevalence was already higher before pregnancy or after childbirth, leading to potentially inaccurate conclusions (Chen, Lo, Chen, Gao, et al., 2024). Some researchers have begun addressing this issue by expanding their studies to collect IPV data from pre-pregnancy to postpartum periods to gather more robust evidence. However, the findings have yielded inconsistent results (Chan et al., 2021; Serpeloni et al., 2019). In this context, a meta-analysis covering an extended period is needed to synthesize findings and contribute to understanding whether pregnancy poses a risk or protective factor for IPV among women. Such an in-depth understanding could provide an overall perspective on IPV among pregnant women, informing early intervention and prevention strategies. Another important follow-up question is whether all women experience similar changes in IPV over time. This question is particularly relevant for targeted interventions. It involves understanding the factors associated with IPV occurrence, individual risk, and protective factors, and tailoring interventions to meet the specific needs of each individual. Indeed, studies have shown variations in the experiences of IPV among pregnant women (Chan et al., 2021; Chen, Lo, Ho, et al., 2022; Islam et al., 2018), providing valuable evidence of heterogeneity within this population. However, a significant limitation is that follow-up periods are often short, such as tracking measurements up to only four months after pregnancy. Longer follow-up periods among pregnant women would provide more accurate insights into the development of trajectories and inform appropriate interventions.

When investigating depressive symptoms in pregnant women, the literature has provided valuable insights into the diverse nature of these symptoms throughout pregnancy and the postpartum period. Several studies have emphasized that not all women experience the same changes in depression during this transitional phase of their lives (Baron et al., 2017; Dekel et al., 2019; Santos et al., 2017). However, a notable

limitation in the current body of research is the incomplete assessment of depressive symptom trajectories over time. Many studies have concentrated on specific time points or have had limited follow-up periods, potentially impeding the accurate evaluation of the developmental patterns of depressive symptoms. For instance, some studies have exclusively examined trajectories during the postpartum period (Torres et al., 2019), while others have predominantly investigated the persistence of maternal depressive symptoms from pregnancy to the first postnatal year (Wikman et al., 2019).

Despite the valuable insights provided by these studies, it is crucial to recognize that depressive symptoms can persist for several years beyond the immediate postpartum period (Kingsbury et al., 2015). To gain a more comprehensive understanding of the trajectories of depressive symptoms, it is important to extend the follow-up period beyond the first year after giving birth. This longer-term perspective allows us to explore the complex, cyclical, and episodic nature of depressive symptoms experienced by women during and after pregnancy. While a few studies have followed women for a few years after childbirth (Denckla et al., 2018; Pellowski et al., 2019), they still have limitations in fully capturing the important factors associated with different trajectories of depressive symptoms. To inform effective prevention and intervention programs, it is essential to conduct more in-depth research that comprehensively examines the patterns of depressive symptoms among pregnant women, including investigating potential risk and protective factors that contribute to the heterogeneity in depressive symptom trajectories (Chen, Lo, Wong, et al., 2024). This knowledge would provide valuable insights for developing targeted and tailored interventions to support the mental health of pregnant women and promote positive outcomes for both mothers and children.

IPV and depressive symptoms are closely linked problems, and current research indicates an association between them (Ankerstjerne et al., 2022; Yuan & Hesketh, 2019). However, determining the causal direction of the IPV-depression association is

often challenging (Devries et al., 2013). This challenge may arise from variations among individuals in the development of IPV and depression. Unfortunately, only a limited number of studies have made attempts to address this crucial matter. By considering these individual differences, we can gain a more comprehensive understanding of the complex interplay between these two problems.

1.3 Correlates and impacts of IPV and depressive symptoms among pregnant women

Examining the factors associated with these developmental trajectories and assessing their impact on children's health can provide valuable insights for future prevention and intervention efforts. To identify the correlates of these trajectories, the ecological framework can be applied in the context of IPV (Ali & Naylor, 2013; Dutton et al., 2005) and is endorsed by organizations such as the Centers for Disease Control and Prevention as a framework for violence prevention (Dahlberg & Krug, 2002) and depressive symptoms (Buzi et al., 2015). Specifically, this dissertation will explore factors at the individual and microsystem levels. At the individual level, research has found that a history of adverse life events has negative effects on both IPV and depressive symptoms (Barrios et al., 2015; McNaughton Reyes et al., 2018). These events can contribute to the development and persistence of both issues. At the microsystem level, social support systems, such as family support and partner involvement in childcare and emotional support, have been shown to have protective effects (Ashenafi et al., 2020; Chan, 2019). These factors can potentially mitigate the negative impacts of IPV and depressive symptoms. However, there is limited research exploring whether these risk and protective factors have differential effects on the trajectories of IPV and depressive symptoms. Understanding these differential effects can provide valuable insights into the unique impacts of these factors on the trajectories of IPV and depressive symptoms among pregnant women. By studying how different factors contribute to the trajectories of these issues, we can identify specific risk and protective factors that can inform the development of targeted interventions. This knowledge can lead to more effective prevention and intervention programs that

address the specific needs of pregnant women experiencing IPV and depressive symptoms, ultimately promoting the well-being of both mothers and children.

As mentioned earlier, both IPV and depressive symptoms among pregnant women can have an impact on the health of their children. Recent research suggests that this negative influence may manifest at a biological level (Chan et al., 2019; Enlow et al., 2021). One frequently studied biomarker used to understand the effects of maternal-fetal processes on the future health of offspring is shortened telomere length (TL) (Entringer et al., 2015). However, some studies have not found significant impacts of maternal adversity, such as exposure to IPV and depressive symptoms, on children's TL (Ämmälä et al., 2020; Naudé et al., 2023). One possible explanation for this inconsistency could be the variability of maternal adversity over time. Therefore, the final objective of this dissertation is to investigate whether different trajectories of IPV and depression have varying effects on the subsequent TL of offspring.

1.4 Rationale of the project

Pregnancy is a crucial period marked by emotional, physical, and relational changes in mothers. For some women, pregnancy can be particularly challenging. It is pivotal for policymakers, healthcare providers, researchers, and advocates to acknowledge and address the impact of maternal health experiences on pregnant women and their children. This entails considering maternal adversity and mental health during and after pregnancy and identifying the resources available for support.

IPV is a significant global public health concern that has detrimental effects on pregnant women. While previous research has explored the association between IPV and pregnancy, there is still much to understand about this relationship. It is important to gain a comprehensive understanding of whether pregnancy acts as a risk or protective factor for IPV among pregnant women. To address this ongoing debate, it is crucial to consider the entire continuum from pre-pregnancy to the postpartum period. By

examining this extended timeframe, we can gather accurate information to inform the policy and program development. Furthermore, adopting a person-centered approach is essential in determining whether women experience different patterns of IPV over time. This individualized approach considers the unique circumstances and experiences of each woman, allowing for a more nuanced understanding of the dynamics between IPV and pregnancy. By considering the personal trajectories and experiences of women, we can uncover valuable insights into the relationship between IPV and pregnancy.

In addition to IPV, many pregnant women experience mental health challenges including depression. However, the literature predominantly focuses on the prevalence of postpartum depression (PPD) and fails to adequately address the question of whether pregnancy increases the risk of PPD, especially from a person-centered perspective. Therefore, the second objective is to investigate whether certain pregnant women experience depression throughout the pregnancy and postpartum period, while others only experience depression after childbirth. This information is crucial for developing effective prevention efforts and targeting resources for the most vulnerable groups, particularly those experiencing chronic difficulties. Additionally, we will examine important factors that may influence these patterns, such as partner involvement, to provide recommendations for prevention and intervention programs.

In addition to separately examining IPV and depression, recent research has started to explore the relationship between these variables during pregnancy and after childbirth. While previous studies have provided initial insights into this association, it is important to acknowledge certain limitations. One limitation is the lack of examination of this relationship using a person-centered approach. Therefore, our study aims to fill this gap by investigating whether IPV at different periods can predict the onset and persistence of depression during both the pregnancy and postpartum periods, and vice versa.

Furthermore, maternal adversity and mental health have been found to have a negative impact on children's health, with a growing focus on biological health outcomes, such as TL. However, there have been limited studies exploring the effects of different trajectories of IPV and depression on TL. Therefore, our final aim will address this research gap by utilizing a longitudinal design to examine and understand the impact of these trajectories on TL.

1.5 Chapter summary

This chapter aims to provide a concise introduction to the scope of IPV and depressive symptoms among pregnant women, along with discussing the associated factors and impacts of these issues. By examining the longitudinal developmental trajectories of IPV and depressive symptoms from pregnancy to the postpartum period, valuable insights can be gained regarding the changing patterns, correlates, and impacts of these problems. This information is crucial for informing practice and policy decisions. To effectively address these issues, it is essential to implement early screening for IPV and depressive symptoms, starting from the pre-pregnancy period and continuing throughout pregnancy. This proactive approach can help identify potential risks and provide timely support to prevent more severe consequences. Moreover, monitoring women beyond the first year after childbirth is important to gain a better understanding of the developmental trajectories of these problems. To comprehensively address the co-occurrence of IPV and depression, a holistic and integrated framework is necessary. Such a framework would facilitate a better understanding of the interplay between these issues and enhance the effectiveness of treatment and interventions. By adopting a comprehensive approach, the aim is to improve the overall well-being of pregnant women and their children.

CHAPTER 2: LITERATURE REVIEW

2.1 IPV and its trajectories against pregnant women

2.1.1 Forms of IPV

IPV refers to any behavior by an intimate partner or ex-partner that causes physical, sexual, or psychological harm (WHO, 2014). The focus of this dissertation is on three specific forms of IPV: physical IPV, sexual IPV, and psychological IPV. Physical IPV involves the use of physical force against the victim, resulting in pain, injury, or physical suffering. Examples of physical IPV include actions such as pushing, shoving, dragging, stabbing, spanking, scratching, hitting, threatening, or using weapons like guns or knives. Sexual IPV refers to the act of physically forcing the victim to engage in sexual intercourse against their will or coercing the victim to perform sexual acts that are degrading or humiliating. It also includes forcing the victim to have sex without protection. Psychological IPV encompasses various behaviors aimed at humiliating and exerting control over the victim. Examples of psychological IPV include verbal abuse, constant criticism, and other tactics designed to demean and control the victim.

2.1.2 Pregnancy and IPV

A community survey revealed that nearly 30% of women have experienced physical and/or sexual violence (WHO, 2018a). IPV during pregnancy is also prevalent (Yüksel-Kaptanoğlu & Adalı, 2019). A more recent meta-analysis reported a worldwide prevalence of 9.2% for physical IPV, 18.7% for psychological IPV, and 5.5% for sexual IPV during pregnancy (Román-Gálvez et al., 2021). In China, a meta-analysis found an overall pooled prevalence of 7.7% for IPV during pregnancy (Wang et al., 2017).

While research has established that IPV occurs during pregnancy, there is still no consensus on whether IPV increases or decreases during pregnancy. Several studies have examined this issue, yielding inconsistent findings. For instance, a cohort study of 960 women aged 18-49 years old found a decrease in IPV prevalence during pregnancy

(31.0%) and after pregnancy (22.6%) compared to before pregnancy (32.4%) (Silva et al., 2011). Similar findings were reported among pregnant women in Oman, with a substantial decline in IPV prevalence during the one-year preceding pregnancy (2.7%) and during pregnancy (1.6%) (Al Shidhani et al., 2020). Conversely, other studies have suggested that the frequency of violence may increase during pregnancy compared to the pre-pregnancy period (Burch & Gallup, 2004). They found that the frequency and severity of violence initiated by men against women are twice as high when women are pregnant.

Various explanations have been proposed for these inconsistent findings. Some researchers argue that IPV decreases during pregnancy due to improved marital relationships and increased partner support (Islam et al., 2018). Conversely, others believe that the stress associated with pregnancy can affect an individual's and couple's coping strategies, possibly leading to an increase or onset of IPV (Van Parys, Deschepper, et al., 2014). These inconsistencies may be partly due to different methodologies of investigation, such as the timings of IPV measurements. The nature of IPV can vary depending on whether it occurs before, during, or after pregnancy (Islam et al., 2018). Research investigating changes in IPV over the perinatal period, which includes the period from pre-pregnancy to the postpartum period, is necessary to accurately estimate the prevalence of IPV (Chan et al., 2021). Several studies have attempted to address this issue by examining the prevalence of IPV from pre-pregnancy to the postpartum period. However, these studies have yielded conflicting results. Using a longitudinal design with a sample of 1083 pregnant women in Hong Kong, researchers found an overall decline in IPV during pregnancy from 24.6% to 14.3% (Chan et al., 2021). However, another study showed that IPV increased following childbirth (Serpeloni et al., 2019). Moreover, several reviews have summarized existing evidence on changes in IPV around the pregnancy period. For example, the prevalence of violence during pregnancy is consistently lower than violence that occurred before pregnancy (Taillieu & Brownridge, 2010). Another recent review reported that most

included studies found a lower overall prevalence of IPV postpartum compared to during pregnancy (Mojahed et al., 2021). While these reviews provide valuable insights into how IPV changes during specific periods, such as before pregnancy versus during pregnancy or during pregnancy versus after childbirth, it is crucial to compare IPV data across multiple time points, including pre-pregnancy, during pregnancy, and after childbirth. This comprehensive approach is necessary to provide a more accurate answer to the question of whether IPV increases or decreases during pregnancy. Extended investigations into IPV changes over the perinatal period are essential for accurately estimating its prevalence (Chan et al., 2021). Without such comparisons, it is difficult to determine whether IPV prevalence was already higher before pregnancy or after childbirth, potentially leading to inaccurate conclusions in the ongoing debate (Chen, Lo, Chen, Gao, et al., 2024).

2.1.3 Trajectories of IPV

Most research on IPV among pregnant women has used a variable-centered method, treating the population as homogeneous and reporting prevalence rates as a whole (Bogat et al., 2005). The variable-centered approach is a traditional approach and its purpose is to examine relationships and patterns among variables rather than individuals or groups (Howard & Hoffman, 2017). In this approach, the emphasis is on understanding how different variables relate to each other and how they collectively contribute to a particular outcome or phenomenon. The goal is to identify the key variables and their effects on the outcome of interest and to understand the overall patterns and trends across the variables. By examining variables systematically and quantitatively, researchers can gain insights into the complex relationships and dynamics at play. However, this approach may be insufficient in capturing the complex nature of IPV experiences during pregnancy, as these experiences can vary significantly among individuals (Chan et al., 2021). In contrast, the person-centered method emphasizes the variability and diversity among individuals and aims to identify distinct subgroups or profiles within a larger population. In a person-centered approach,

researchers collect data on multiple variables or indicators and use statistical techniques such as cluster analysis or latent profile analysis to identify meaningful subgroups. These subgroups may be based on specific patterns of variables or shared characteristics that differentiate them from other individuals or groups (Howard & Hoffman, 2017). The goal of the person-centered approach is to provide a more nuanced understanding of individuals or groups by recognizing the heterogeneity within a population. It allows researchers to identify different profiles or typologies that may have distinct needs, preferences, or outcomes. By identifying and analyzing these subgroups, researchers can tailor interventions, policies, or programs to better meet the unique needs of different individuals or groups. In the current case, this approach acknowledges that women may exhibit different patterns and trajectories of violence throughout the perinatal period. For example, some women may only experience IPV during pregnancy, while others may experience persistent IPV from pre-pregnancy to after childbirth. This suggests that there are individual heterogeneities in the experiences of IPV among women throughout the perinatal period.

Studying episodic and continuous IPV is crucial for gaining a richer and more accurate understanding of IPV among pregnant women (Howard & Hoffman, 2017). By identifying different groups, prevention and intervention programs can be tailored more effectively to the specific high-risk groups. The typological perspective on violence, which categorizes individuals based on their patterns of violence, has found unique individual changes (Johnson, 1995; Johnson & Leone, 2005). Empirical studies have increasingly supported this notion. For example, a study conducted with South African women revealed relatively stable mean trajectories of IPV from pregnancy into the postpartum period, indicating that the overall risk for IPV does not significantly increase or decrease during this time (Groves et al., 2014). However, the study also highlighted significant variability across women in their individual trajectories, with some experiencing an increased or decreased risk for IPV. A study in Bangladesh among 426 new mothers identified different patterns of IPV (Islam et al., 2018): Of the women

who experienced IPV before their pregnancy (*n* = 306, 71.8%), more than 90% also reported being victims of IPV during their pregnancy. Furthermore, out of the 279 women who experienced any form of IPV during their pregnancy, 92.8% of women also reported experiencing IPV after giving birth, and only 7.3% of women indicated that they did not experience violence following the birth of their child. This study had limitations due to its cross-sectional design, which made it challenging to track the long-term effects or changes over time. Currently, there is a limited number of longitudinal studies specifically focusing on IPV among pregnant women. A longitudinal study in Hong Kong (*n* = 1,083) identified four patterns of IPV among pregnant women spanning from before pregnancy to after pregnancy: (a) sustaining abusive relationship (13.2%); (b) relationship with decreased violence over pregnancy (11.4%); (c) relationship with stress-related violence (9.1%); and (d) nonviolent relationship (66.3%) (Chan et al., 2021). The authors also found that women who identified as being in sustaining abusive relationships and stress-related violence groups experienced poorer mental health outcomes. However, it is important to note that this study focused on IPV only from pre-pregnancy to 4 weeks postpartum, while the recurrence of IPV may persist for years (Islam et al., 2018). Furthermore, there is a lack of studies specifically examining IPV during the postpartum period (Mojahed et al., 2021).

In conclusion, while there have been studies investigating IPV among pregnant women, there is a lack of comprehensive data on pre-pregnancy IPV and long-term follow-up to examine the various patterns of IPV. This limitation hinders our understanding of whether pregnancy increases the risk of IPV. Additionally, there are variations in time assessments and definitions of IPV across literature, and only a few studies have adopted an individual-centered approach to explore changes in IPV experiences. Therefore, the first objective of the current study is to longitudinally track women as they transition into parenthood and determine whether different women exhibit diverse patterns of IPV. By taking an individual-centered approach, this research aims to

provide clinical practitioners and researchers with a clearer understanding of which groups of women are at a higher risk of experiencing specific patterns of IPV. This knowledge can inform the development of targeted interventions and support systems to address the unique needs of these high-risk groups.

2.2 Depression and its trajectories among pregnant women

2.2.1 Definition of perinatal depression

The perinatal period, which encompasses the time before and after childbirth, is a critical phase in a woman's transition to motherhood and can be a vulnerable period for the development of mental health conditions (Langan & Goodbred, 2016). Among these conditions, depression is the most prevalent mental health problem (Sheeba et al., 2019). Perinatal depression (PND) is defined as depression that occurs during pregnancy (antepartum depression, AND) or weeks after delivery (postpartum depression, PPD) (DSM, 2013). PND can have significant adverse effects on the mother's health, as well as the cognitive and emotional development of the child over the long term (Dagher et al., 2021).

2.2.2 Pregnancy and depression

The prevalence of depression among women in the general population across various countries is reported to be 14.4% (Lim et al., 2018). Regarding the prevalence of depression among pregnant women, a review of 56 countries found that the pooled prevalence of postpartum depression (PPD) was 17.7% (Hahn-Holbrook et al., 2018). Another review that focused on longitudinal studies reported an average prevalence of 17% for antepartum depression and 13% for postpartum depression. Furthermore, the review indicated that 39% of women who experienced AND went on to develop PPD (Underwood et al., 2016). Most of the literature has primarily focused on PPD, given its adverse effects on maternal health, such as the development of chronic diseases (Abdollahi & Zarghami, 2018), as well as its impact on children's development, such

as low birth weight (Farías-Antúnez et al., 2018). Untreated maternal depression may impair parenting qualities, such as less positive or more negative parenting (Goodman et al., 2020). These negative consequences highlight the urgent need to identify factors contributing to the development of PPD. A recent meta-analysis demonstrated that depression-related factors, such as a history of depression, depression during pregnancy, or experiencing maternity blues, may predispose mothers to PPD (Zhao & Zhang, 2020). Additionally, a follow-up study revealed that experiencing a depressive disorder in the first trimester of pregnancy could predict PPD (Kirkan et al., 2015). However, a remaining question is whether AND persists into the postnatal period, particularly from a person-centered perspective. Some women may experience depression both during pregnancy and after childbirth, while others do not encounter such a situation. Further research is needed to understand the individual trajectories and patterns of depression from pregnancy to the postpartum period and to identify factors that contribute to the persistence or remission of depression across this transition.

2.2.3 Trajectories of depression

The literature has demonstrated that depression among pregnant women is not uniform, and symptoms can vary in terms of their spectrum, severity, duration, and recurrence over time. Several reviews have identified distinct patterns of depressive symptoms, including low, medium, or chronic-high symptom levels (Baron et al., 2017; Santos et al., 2017). The identification of different symptom profiles is crucial as it allows for targeted intervention programs to be provided to the most vulnerable groups. For instance, a cohort study conducted in sub-Saharan Africa, which followed women from pregnancy to 18 months postpartum, identified five distinct patterns of depressive symptoms: moderate levels during pregnancy with minimal symptoms postpartum, minimal levels during pregnancy with increasing symptoms postpartum, unstable levels peaking at 12 months postpartum, mild levels with a slight decrease postpartum, and severe levels during both pregnancy and postpartum (Pellowski et al., 2019). Similarly, another study conducted among South African women classified four patterns of

depressive symptoms from pregnancy to 18 months post-birth: chronic low, late postpartum, early postpartum, and chronic high (Garman, Cois, et al., 2019). These findings provide valuable insights: Pregnant women who exhibit chronic and persistent symptoms throughout pregnancy and the postpartum period represent the highest-risk group and may require increased attention and support. However, there are still important issues that need further exploration.

There is a need to better understand the changing patterns of maternal depression from pregnancy to parenthood. Many studies have examined patterns only during the postpartum period or focused primarily on the persistence of depressive symptoms from pregnancy to the first year after childbirth (Depression & Causes, 2015; Sidebottom et al., 2014; Wikman et al., 2019). However, depression during the perinatal period can persist for several years, as evidenced by studies that have followed a subset of mothers experiencing chronic depression for up to 21 years after delivery (Kingsbury et al., 2015). Nevertheless, longitudinal studies examining the course and predictors of women's mental health conditions, such as depression, beyond the second year postpartum are limited (Giallo et al., 2014). Considering symptom fluctuations at multiple time points is important for identifying women who may be experiencing chronic or delayed-onset patterns (Dekel et al., 2019).

Persistent depressive symptoms have negative impacts on both maternal and infant health. For example, a study that followed mothers from 18 weeks of gestation to when their children were 11 years old found that 26% of non-depressed offspring of mothers with chronic-severe depression reported suicidal ideation (Hammerton et al., 2015). Therefore, screening only within the first few weeks or months after childbirth, or focusing on a single period (e.g., postpartum), may overlook the complex, cyclical, and episodic nature of depressive symptoms, making it difficult to effectively identify women at risk later on (Garman, Schneider, et al., 2019). On the other hand, although there has been growing research spanning a few years postpartum (Denckla et al., 2018;

Luoma et al., 2015; Pellowski et al., 2019), the under-recognition of certain important modifiable factors, such as the partner's involvement, remains a concern that needs to be addressed in future studies.

In summary, depression among pregnant women can persist for several years. Many studies have focused on examining patterns within the postpartum periods or the persistence of depressive symptoms from pregnancy to the first year after childbirth. While the first objective of the study is to examine whether different women exhibit diverse patterns of IPV, the second objective is to explore the changing patterns of depression from pregnancy to beyond the first year (i.e., 3 years after childbirth in the present study). By extending the investigation into the longer-term trajectory of depression, the study aims to provide more comprehensive and accurate information on this topic. This will contribute to a better understanding of the persistence, remission, or recurrence of depressive symptoms among pregnant women and mothers, beyond the initial postpartum period.

2.3 The association between IPV and depression among pregnant women

The causal relationship between IPV and depression is not straightforward (Devries et al., 2013). The association between the two may be bidirectional, meaning that women with depressive symptoms are more likely to experience IPV, and women who experience IPV are at a higher risk of developing depressive symptoms (Ankerstjerne et al., 2022; Yuan & Hesketh, 2019). Several hypotheses have been proposed to explain the relationship between IPV and depression. IPV affects depression through various mechanisms. Individuals who are exposed to IPV may develop depression due to the traumatic and psychological stress reactions they experience (Sparrow et al., 2017). These reactions can include fear, feelings of isolation, and a sense of unworthiness (Devries et al., 2013). Additionally, cultural, social, and behavioral factors may contribute to understanding why IPV can lead to subsequent depression (Zhang et al., 2019). For example, women who are victims of violence may be hesitant to disclose

their experiences due to social stigma. Therefore, the expression of depressive symptoms may serve as an indirect plea for help and a response to the violence they have endured (Zhang et al., 2019). Finally, experiencing violent events can lead to psychological trauma and increased psychological sensitivity, which in turn raises the risk of developing postpartum depression (Leung et al., 2002).

While it is recognized that IPV can contribute to depressive symptoms, it is important to consider the reverse relationship as well, as supported by several assumptions. One possibility is that depression influences partner selection, meaning that individuals experiencing depression may be more likely to enter into relationships with partners who have poor impulse control or other factors that increase the likelihood of violence (Devries et al., 2013). Additionally, perpetrators of violence may intentionally seek out individuals whom they can victimize, potentially targeting those who exhibit signs of learned helplessness associated with depression (Abramson et al., 1978). Learned helplessness suggests that individuals with depression may become accustomed to enduring painful stimuli, making them less likely to escape from adverse experiences.
Growing meta-analysis and systematic review have documented a positive relationship between IPV and depression (Hutchens & Kearney, 2020). For example, women with a lifetime history of sexual victimization had 51% greater odds of experiencing PND when compared with women with no history of sexual victimization (Lombardi et al., 2021). A meta-analysis found that IPV was the most common predictor of PPD and indicated a 5.46-fold increased risk of PPD among women exposed to IPV (Desta et al., 2021). Moreover, a review found physical, sexual, and psychological IPV were independently associated with PND (Paulson, 2020). An updated meta-analysis has further found that IPV and its subtypes had statistically significant impacts on PPD (overall: OR = 2.50, physical: OR = 2.31, psychological: OR = 2.22, sexual: OR = 1.75) (Wei et al., 2023). Previous studies largely support the relationship between IPV and depression (Ghoneim et al., 2021; Manongi et al., 2017). For instance, a survey conducted in Bangladesh found that all forms of IPV, except sexual IPV, were strongly

associated with the development of PPD (Tasnim et al., 2021). Similarly, a study based on Jordan samples found that all forms of IPV had a significant effect on developing depression (Damra & Abujilban, 2018). However, while a strong correlation between IPV and depression has been established in cross-sectional studies, determining the causal relationship requires further examination using longitudinal data to responsibly determine the direction of these two issues (Paulson, 2020). Specifically, (1) IPV predicts depression: Some studies have shown that IPV acts as a risk factor for depression during pregnancy and postnatal periods (Bitew et al., 2019; Kirkan et al., 2015). For example, a prospective cohort study conducted in northeastern Brazil found that psychological IPV during pregnancy was strongly associated with PPD, independent of physical or sexual IPV (Ludermir et al., 2010). However, this study was limited by the lack of available data on depression during pregnancy. Furthermore, depression predicts IPV: A study with women living with HIV in rural South Africa found maternal depression was related to psychological IPV from baseline to 32 weeks of pregnancy and from 32 weeks of pregnancy to 6 months, but not from 6 months to 12 months postnatally (Rodriguez et al., 2020).

The studies reviewed above provide important insights into the correlation between IPV and depression. However, some limitations should be noted. First, there is limited research that covers both the pregnancy and postpartum periods to explore the bi-directional relationship between IPV and depression. Examining both periods is crucial for a more comprehensive understanding of these issues. Second, there is a lack of exploration regarding the heterogeneity of problems, such as whether IPV during pregnancy can predict the onset and persistence of depression, or vice versa. This analysis is important for targeting interventions to the most at-risk groups and making treatments more efficient. Recent studies have made contributions to this topic. For example, a cohort study with 813 Chinese pregnant women found that IPV was associated with increased severity and a slower prognosis of PND symptoms (Hou et al., 2020). A 10-year study conducted in Australia involving 1507 mothers identified

four distinct classes of IPV: (1) minimal IPV, (2) early IPV exposure, (3) increasing IPV, and (4) persistent IPV. The study further found that women in the persistent IPV pattern had the highest levels of depressive symptoms at 12 months postpartum, with these symptoms increasing in severity over time (Fogarty et al., 2023). However, more research is needed to examine the bi-directional association between trajectories of IPV and depression and vice versa.

In summary, fewer studies have considered the heterogeneity of problems in both the pregnancy and postpartum periods, such as whether IPV during pregnancy can predict the onset and persistence of depression, or vice versa. The third aim of the current study is to explore whether IPV at different periods can differentiate different trajectories of depressive symptoms, and vice versa. Further research is needed to better understand the complex relationship between IPV and depression during the perinatal period.

2.4 Common correlates of IPV and depression among pregnant women

In addition to identifying the changing patterns of IPV and depression, it is crucial to investigate the determinants and correlates of these patterns. This research objective aims to facilitate early identification and provide prenatal and postnatal support for women who are at risk of persistent problems. The risk and protective factors associated with IPV and depression are likely to be multifactorial, encompassing various aspects of women's lives. In this project, we considered factors related to women themselves, such as adverse childhood experiences, which can have a lasting impact on mental health. Additionally, we explored environmental factors, such as social support, which can play a significant role in buffering the negative effects of IPV and depression. Furthermore, we examined the involvement of the partner, recognizing that their support and behavior can influence women's experiences of both IPV and depression.

Adverse childhood experiences (ACEs)

ACEs encompass a range of severe and recurring stressors that individuals may have

endured during their childhood. These adversities include various forms of abuse, neglect, witnessing violence between parents or caregivers, experiencing household dysfunction such as substance abuse, and exposure to peer, community, and collective violence (Felitti et al., 1998; WHO, 2018b). A meta-analysis of 206 studies from 22 countries, with 546,458 adult participants, reported that the pooled prevalence of the five levels of ACEs: 39.9% for no ACE; 22.4% for one ACE; 13.0% for two ACEs; 8.7% for three ACEs, and 16.1% for four or more ACEs (Madigan et al., 2023). During the perinatal period, ACEs warrant particular attention due to their potential impacts on both the mother and the child (Osofsky et al., 2021).

Females who experienced childhood abuse are at a higher risk of becoming victims of IPV in adulthood (Fredland et al., 2015). Existing literature has highlighted that emotional dysregulation, maladaptive interpersonal schemas (e.g., shame and abandonment), poor social functioning, and psychological disorders because of early adversities (e.g., psychological abuse) may lead to dysfunctions in adulthood intimate relationships (Riggs, 2010). A population-based household survey of women aged 15–49 years found that a history of exposure to childhood sexual abuse was significantly related to further IPV compared with those who did not have such experience (Abramsky et al., 2011). Therefore, childhood adversity, such as childhood maltreatment, may increase the risk of re-victimization by an intimate partner in women's adult lives (Fredland et al., 2015). This pattern is also observed among pregnant women. For instance, a study conducted with South African women found that pregnant women who experienced child abuse and forced sex were more likely to be victims of IPV (McNaughton Reyes et al., 2018), which is supported by another report (Barrios et al., 2015). Despite these significant findings, very few studies have examined the predictive effects of ACEs on the changing patterns of IPV. Further research is needed to better understand the relationship between ACEs and IPV dynamics over time. Such studies can provide valuable insights into the mechanisms underlying the intergenerational transmission of violence and inform interventions

aimed at breaking this cycle.

The accumulation of ACEs significantly increases the risk of depression (Hughes et al., 2017). It is crucial to explore this issue among pregnant women, as pregnancy is a period that can be particularly stressful for women, especially those who have experienced childhood trauma. ACEs have been associated with negative parenting outcomes (Scorza & Monk, 2019). Pregnant women with a history of ACEs may have lower confidence in their ability to be or become parents due to past negative memories and emotions (Scorza & Monk, 2019), which can contribute to the development of depression. Previous research has indicated that pregnant women with a history of ACEs are at a higher risk of experiencing depression during the perinatal period (Racine et al., 2021; Zhao & Zhang, 2020). However, evidence suggests that the association between ACEs and depression may differ depending on the timing of the assessment. One study found that total ACEs were associated with early depression but not late in pregnancy (Samia et al., 2020). Another study did not find a relationship between ACEs and maternal postpartum depression (Menke et al., 2019). Hormonal and immune changes during pregnancy, rather than the postpartum period, may render women with a history of childhood adversities particularly vulnerable to depression during pregnancy (Menke et al., 2019). Therefore, it is important to consider the timing of perinatal mental health assessments about maternal exposure to ACEs (Racine et al., 2021). Further research is needed to better understand the complex interplay between ACEs, maternal mental health, and the timing of perinatal depression. This knowledge can inform the development of targeted interventions and support strategies for pregnant women with a history of childhood adversities, ultimately improving their mental well-being during this critical period.

Social support

Social support plays a crucial role in IPV and mitigating its adverse effects on pregnant women (Chan et al., 2021). It encompasses emotional, physical, and informational

support from interpersonal relationships, such as family, friends, and significant others. Adequate social support promotes positive psychological adaptation, helps individuals overcome challenges, and enhances problem-solving abilities (Lee & Lee, 2017). Previous research has shown that insufficient support during pregnancy is associated with an increased risk of abuse (Lee & Lee, 2017), while higher levels of social support can enable women who have experienced IPV to cope effectively by enhancing self-efficacy and self-esteem (Bradley et al., 2005). Furthermore, a longitudinal study found that poorer social support was significantly related to greater severity of IPV from pre-pregnancy to 4 weeks postpartum (Chan et al., 2021). However, most of these studies did not follow up with victims over an extended period to assess the persistent protective influence of social support on different patterns of IPV.

Social support has also been found to have a protective effect against depression. A prospective cohort study conducted in China identified the lack of postnatal family support, particularly from the husband, as a significant risk factor for postpartum depression (Xie et al., 2010). Another study examining the prenatal and postnatal periods found that insufficient social support was associated with reporting depressive symptoms during pregnancy but not after delivery (Sidebottom et al., 2014). Therefore, it is important to consider potential moderators, such as methodological factors, that may amplify or attenuate the association between social support and depression (Racine et al., 2020). This notion aligns with a prior study suggesting that differentiating the influence of social support during different gestational periods may have important implications for preventing depression in pregnant women (Xie et al., 2010). Based on the findings of previous studies, our current investigation aims to explore the predictive effect of social support on different patterns of depression among pregnant women.

Partner involvement

The involvement of a partner in pregnancy is of great importance and has gained increased attention (Chan et al., 2017). Partners play a unique role in influencing the

health of both the mother and the child. Partner involvement during pregnancy may encourage positive health behaviors in fathers, such as quitting smoking or reducing alcohol consumption (Bottorff et al., 2009). Additionally, involved partners may be better prepared for parenthood, leading to a reduction in conflicts and an improvement in marital satisfaction. These factors can help to mitigate the negative effects of IPV on PPD (Chan, 2019).

A growing body of evidence has highlighted the positive and crucial impact of partner involvement on health and intimate partner relationships. For instance, a study found that partner support for antenatal care reduced physical IPV by 56% (Ashenafi et al., 2020). Partner involvement during pregnancy and the postpartum period had significant benefits and reduced the risk of PPD by 64% (Yargawa & Leonardi-Bee, 2015). Similar findings were observed in a Taiwanese sample, where lower levels of partner involvement (such as paternal childcare and nursing frequency) were independently associated with an increased risk of maternal PPD, particularly among unemployed mothers (Lin et al., 2017). Another study found that partner involvement was significantly associated with lower levels of maternal depression at 3 months and 12 months postpartum, but not at 6 months (Maselko et al., 2019). However, one main limitation of these studies is that they did not consider the heterogeneity of IPV and depression patterns. Therefore, further examination is needed to determine whether partner involvement can predict the changing patterns of IPV and depression.

In summary, the present study aims to examine important risk factors (such as adverse childhood experiences) and protective factors (such as social support and partner involvement) in the trajectories of IPV and depression. By investigating these factors, we can gain a better understanding of their impact and inform interventions to promote the well-being of pregnant women and their families.

2.5 Impacts of IPV and depression trajectories on children's biological health

Maternal IPV and depression were associated with poorer social-emotional, cognitive, language, motor, and adaptive behavior development in offspring (Rogers et al., 2020; Toso et al., 2020). Growing research has indicated that these negative experiences can have effects that extend beyond the mental health of the victims, as research has discovered that these effects may manifest in the biological health of individuals. This phenomenon is often referred to as being "under the skin" (Bhutta et al., 2023), indicating that negative experiences can influence the physiological health of individuals. For instance, a meta-analysis revealed a significant positive association between victimization and inflammation (Chen et al., 2023). Therefore, this current study explored whether IPV and depression trajectories can affect children's biological health.

Psychological stressors and mental health issues among pregnant women can have an impact on fetal development, which in turn can affect the physical and mental health of the offspring (Van Den Bergh et al., 2020). Therefore, understanding the biological mechanisms that underlie the negative influence of maternal prenatal psychological adversities on the offspring is crucial (Naudé et al., 2023). One potential biological marker that has gained attention in this regard is shortened telomere length (TL), which may explain the long-term impacts of maternal-fetal processes on the future health of the offspring (Entringer et al., 2015). Telomeres are composed of repetitive DNA sequences and they protect the ends of chromosomes, preventing genomic integrity from being compromised during replication (Blackburn et al., 2015). TL at birth determines the initial length of an individual's telomeres, and subsequent attrition over time leads to shorter telomere length (Factor-Litvak et al., 2016). Telomeres naturally become shorter as cells replicate and due to oxidative stress. When telomeres become critically short, cells enter a state of senescence (Bernadotte et al., 2016). Shorter telomere length has been associated with early mortality (Shalev, Entringer, et al., 2013) and psychiatric disorders (Malouff & Schutte, 2017).

Existing work has expanded its focus beyond the genetic heritability and individual characteristics of children to investigate various environmental influences on TL. Multiple aspects of the prenatal environment are associated with the TL of offspring. Maternal demographic characteristics, such as maternal age (Ly et al., 2019), BMI (Martens et al., 2016), and income (Coimbra et al., 2017), have been shown to be linked to the TL of offspring. Additionally, there has been growing interest in examining the influence of maternal adversity, physical, and psychological health on TL. Therefore, in this study, we primarily focused on these later risk factors related to mothers.

On one hand, TL is susceptible to oxidative stress, and adverse childhood experiences play a significant role in TL erosion. A meta-analysis revealed a significant inverse association between childhood exposure to family violence and TL (Chen, Lo, Chan, et al., 2022). Patients with a history of childhood sexual, physical, or emotional abuse, particularly those diagnosed with schizophrenia and bipolar disorder, exhibited shorter TL compared to healthy individuals and patients without a history of childhood maltreatment (Aas et al., 2019). A longitudinal study involving 236 children aged 5 to 10 found that exposure to two or more forms of violence, including domestic violence, bullying victimization, and maltreatment, was associated with significant telomere erosion, even after accounting for confounding factors (Shalev, Moffitt, et al., 2013). Additionally, higher maternal ACEs were associated with shorter infant TL (Esteves et al., 2020; Jones et al., 2019). Meanwhile, maternal experience of IPV as a source of stress during pregnancy has been found to potentially impact children's TL. Chan and colleagues (2019) discovered that IPV, particularly psychological and sexual abuse experienced by women before childbirth, was significantly associated with reduced TL in newborns (Chan et al., 2019). This study provided initial evidence that IPV perpetrated by current partners before childbirth was linked to TL shortening in their newborns. On the other hand, a two-year study involving African mothers and their newborns found that maternal recent or lifetime IPV was not significantly associated with TL in their children at birth or two years of age (Naudé et al., 2023). Collectively,

these findings suggest that TL is highly sensitive to maternal adversity, including childhood experiences and IPV. However, further research is needed to fully understand the complex relationship between maternal adversity and TL, and its long-term implications for children's health.

On the other hand, physical and psychological health also play a critical role in affecting children's TL. Maternal chronic illness is one of the factors with inconsistent results as highlighted in a review (Oerther & Lorenz, 2018). For instance, some studies found that maternal chronic illness was negatively associated with telomere length at birth (Schneper et al., 2023), while others did not, such as no significant difference in cord blood telomere length in offspring from gestational diabetes mellitus and normoglycemic pregnant women (Pérez-López et al., 2023). However, few studies have included multiple and varied types of maternal chronic illness to examine whether the severity of chronic illness may impact children's TL. In addition, researchers have called for further investigation to determine whether maternal mental health during pregnancy predicts TL in newborns (Enlow et al., 2021). The literature presents inconsistent findings in this regard. A review has summarized that maternal depression is associated with shortened TL in children (Coimbra et al., 2017). Another study involving 151 mother-infant dyads found that maternal depression during pregnancy was linked to shorter TL in male newborns (Enlow et al., 2018). However, Ämmälä and colleagues conducted a study with 1405 infants and found that maternal depression was not a significant factor associated with infants' leukocyte TL (Ämmälä et al., 2020). Similar nonsignificant results were found in other studies as well (Naudé et al., 2023). The inconsistent results observed in previous studies may be attributed, in part, to methodological considerations. It is possible that the chronicity of prenatal psychological adversities plays a significant role in determining the magnitude of their effects on offspring's TL (Naudé et al., 2023; Rentscher et al., 2020). Moreover, different individuals may exhibit distinct trajectories of IPV and depression over time, which could have varying impacts on the offspring's TL. Therefore, it is crucial to

conduct a nuanced examination of these different impacts to gain a more comprehensive understanding.

The fourth objective of the present study is to investigate whether the influence of maternal adversity, physical and psychological health on TL. Specifically, the severity of maternal adverse childhood experiences and chronic illness will be tested. Furthermore, different trajectories of IPV and depression on future TL of offspring will also be tested. Such investigations are necessary to provide valuable information for the development of an integrated framework to address IPV and depression. This knowledge can then be utilized in the design and implementation of more effective and comprehensive intervention programs.

2.6 Research gaps

IPV and depression are significant challenges faced by pregnant women (Ogbonnaya et al., 2013). with adverse effects on both women and their children. Previous studies have provided valuable insights into these issues. However, there are still important aspects that require further clarification with rigorous methodologies and longitudinal designs.

Firstly, the existing findings regarding whether pregnancy increases the risk of IPV are inconsistent. Some researchers propose that IPV escalates during pregnancy due to increased stress in this period (Van Parys, Deschepper, et al., 2014), while others argue that pregnancy might improve marital relationships and potentially reduce IPV (Islam et al., 2018). There are several reasons for this situation. Firstly, most previous research did not consider IPV experiences before pregnancy and after childbirth, limiting the ability to compare changes in IPV from pre-pregnancy to postpartum. This is crucial because a history of violence is a significant predictor of future IPV victimization (Boyacioğlu et al., 2021). Additionally, many previous studies utilized a variable-centered approach, which may not accurately capture changes in IPV, as some women

may experience IPV consistently throughout the entire period, while others may not experience it at all. Instead, a person-centered approach could identify distinct groups of individuals with similar patterns of IPV, leading to more effective interventions (Howard & Hoffman, 2017). Therefore, the first objective of this dissertation is to investigate whether pregnancy is a risk factor for IPV. This goal entails shifting from a variable-centered perspective to a person-centered perspective, considering individual changes in the prevalence of IPV from pre-pregnancy to postpartum.

Secondly, PPD is a serious mental health issue that negatively affects numerous women after childbirth (Hahn-Holbrook et al., 2018). Previous studies examining whether pregnancy contributes to PPD rarely compared depression from pregnancy to beyond the first year after childbirth using a person-centered perspective. Hence, the second objective of this dissertation is to address this issue. We will further explore the risk and protective factors associated with trajectories of IPV and depression, with a specific focus on ACEs, social support, and partner involvement.

Thirdly, the association between IPV and depression among pregnant women (i.e., whether IPV leads to depression or if depression precedes IPV) is still in debate. As mentioned earlier, cross-sectional studies can only focus on one period (e.g., during pregnancy or postpartum), while longitudinal studies have provided some initial evidence (e.g., IPV during pregnancy predicting depression after childbirth). However, fewer studies have explored the bidirectional association from a person-centered perspective (i.e., whether IPV can predict changing patterns of depression from pregnancy to postpartum and vice versa). Gaining a deeper understanding of this bidirectional association can help shed light on the nature of the relationship. Therefore, the third objective of this dissertation is to clarify the bidirectional association between IPV and depression during pregnancy and after childbirth from a person-centered perspective.

Lastly, it is important to explore the impacts of IPV and depression on children's biological health to elucidate the mechanisms linking maternal adversity and health to children's outcomes. However, limited studies have examined how different trajectories of maternal IPV and health have distinct effects on children's TL. Therefore, the fourth objective of this dissertation is to investigate the impacts of maternal ACEs, chronic illness, and the trajectories of IPV and depressive symptoms on children's TL.

2.7 Chapter summary

This chapter summarizes a literature review on two significant public health challenges faced by pregnant women: IPV and depression. The literature on these topics reveals inconsistent findings regarding whether pregnancy increases or decreases the occurrence of IPV and depressive symptoms. One potential reason for this inconsistency is the variation in time measurements used to assess these problems. Additionally, different individuals may exhibit distinct trajectories of IPV and depression over time, offering a more nuanced perspective on this debate. To tackle this issue, the current project employs a 3-year longitudinal design with the following objectives: (1) to track the trajectories of IPV and depression from pregnancy through the postpartum period and to assess their interrelation, (2) to identify the risk and protective factors linked to these trajectories, and (3) to examine whether distinct trajectories of maternal IPV and depression have varying associations with children's TL. In summary, the current project aims to provide a comprehensive and integrated understanding of IPV and depression among pregnant women, spanning from pregnancy to the postpartum period. It specifically focuses on exploring the trajectories of IPV and depression, their associated factors, and their impacts. This in-depth exploration is expected to provide valuable information regarding the management of IPV and depression in pregnancy care.

CHAPTER 3: THEORETICAL FRAMEWORK

In this chapter, I will delve into the typology of IPV and depression. The objective is to shed light on the evolving patterns of these two issues. Additionally, I will adopt a public health approach to enhance our understanding of the factors that contribute to the risk of and protection against IPV and depression, as well as their health consequences.

3.1 Typology of IPV

IPV is a dynamic issue that changes over time. Violent relationships can be heterogeneous, with various patterns occurring simultaneously (Johnson & Leone, 2005). However, previous research often failed to differentiate between various patterns of IPV, resulting in inconsistencies in measurement and conceptualization. This lack of differentiation obscures within-group differences and hampers the development of reliable tools to identify at-risk groups and create targeted treatment programs for specific IPV subgroups (Bernardi & Day, 2015).

IPV is not a homogeneous phenomenon but instead has several distinct types (Alexander & Johnson, 2023). Currently, there is no standardized theory to conceptualize IPV subgroups. According to a systematic review of exploratory clustering and classification studies of IPV categorization, various theories have been proposed to describe different typologies (Alexander & Johnson, 2023). Some typologies are based on personality profiles, severity levels, and the variety of violent acts. Two well-studied IPV typologies are Holtzworth-Munroe and Stuart's (1994) typology and Johnson's (1995) typology. Holtzworth-Munroe and Stuart's (1994) typology proposed three different types of IPV based on the severity and generality of violence, as well as the psychopathology of the perpetrator (Holtzworth-Munroe & Stuart, 1994). The first type is the "family-only batterer", which has a low severity of violence and is the least likely to engage in sexual or psychological abuse. The violence of this group is generally restricted to family members. The second type is the

"dysphoric/borderline batterer", who engages in moderate to severe wife abuse, including psychological and sexual abuse. The violence in this group primarily occurs within the family, although some extrafamilial violence and criminal behavior may be evident. These perpetrators are the most dysphoric, psychologically distressed, and emotionally volatile, and they may have problems with alcohol and drug abuse. The third type is the "generally violent/antisocial batterer", who engages in moderate to severe marital violence, including psychological and sexual abuse. These perpetrators engage in the most extrafamilial aggression and have the most extensive history of related criminal behavior and legal involvement. They also have problems with alcohol and drug abuse, and they are the most likely to have an antisocial personality disorder or psychopathy.

In current study, Johnson's framework was used because it was most widely used over the past two decades and has been empirical tested (Anderson, 2009). This typology draws on feminist theory and family violence theory. Feminist theory views IPV as a manifestation of control, rooted in long-standing male dominance within intimate relationships (Yllö & Bograd, 1988). Family violence theory regards IPV as a result of conflict arising from everyday stressors in family life, which can escalate to violence (Straus et al., 1980). Building on these theories, Johnson proposed two main types of IPV: One characterized by partner control and the other arising from specific situational factors. Based on this, he classified four IPV typologies: Situational couple violence, intimate terrorism, violent resistance, and mutual violent control (Johnson, 2006). The key distinction lies in whether control and power dynamics are central to the violent relationship.

a) Intimate terrorism, also known as coercive controlling violence, is a less common type of IPV where the perpetrator consistently employs violence to maintain dominance over their partner. This involves tactics such as monitoring, isolating, and instilling fear. Intimate terrorism is characterized by its severity and tends to escalate over time. Within this typology, there are two subtypes: antisocial intimate

terrorists and dependent intimate terrorists. Both subtypes exhibit impulsive behaviors and accept the use of violence against women, but there are slight differences between them. For instance, individuals classified as antisocial intimate terrorists typically have higher scores on measures of antisocial personality traits and engage in violent behavior not only towards their partners but also towards others outside the family. On the other hand, individuals classified as dependent intimate terrorists are emotionally dependent, prone to jealousy, and seek to control their partners for emotional reasons.

b) Situational couple violence, also known as common couple violence, is characterized by infrequent and less severe incidents of aggression that occur in specific situations, such as when arguments escalate within the family or intimate relationship. Unlike intimate terrorism, situational couple violence lacks a long-term motivation for control or power over the partner. This typology is more likely to reflect ineffective communication and a lack of conflict resolution skills within the couple. Perpetrators of situational couple violence are less inclined to engage in violence outside of the family context and are less likely to hold hostile attitudes toward women.

c) Violent resistance refers to the use of violent behaviors by a victim in response to coercive controlling violence. It involves acts of self-defense to protect oneself against the perpetrator.

d) Mutual violence control describes relationships where both partners engage in violent behaviors toward each other. In such cases, violence is reciprocal and exhibited by both individuals involved in the relationship.

Past research has utilized Johnson's typology to investigate the experiences of IPV. For instance, a survey of a school-based sample of youth discovered that the majority of

participants reported experiencing situational couple violence, while coercive controlling violence was associated with more frequent and severe acts of violence (Zweig et al., 2014). However, the study did not specifically address the motives behind violence, which is an important consideration as some instances of violence may arise from playful or accidental situations. Therefore, longitudinal designs are crucial to understanding how IPV persists or changes over time (Hardesty & Ogolsky, 2020). A study about IPV among pregnant women found that abusive relationships occurred over a relatively prolonged period characterized by coercive controlling violence (Chan et al., 2021). The authors also identified instances of stress-related violence, which aligns with the concept of situational couple violence. Notably, intimate terrorism is of particular interest from a risk management and intervention standpoint, as it has the potential to escalate over time and result in more severe consequences (Johnson, 2006). For instance, the National Violence Against Women survey discovered that victims of intimate terrorism exhibited more symptoms of post-traumatic stress disorder and experienced a higher prevalence of mental health problems (Johnson & Leone, 2005).

Distinguishing the heterogeneity within IPV has several advantages. Firstly, it allows for a more accurate understanding of prevalence, which is essential for prevention efforts. Existing literature that treats IPV as a homogeneous group by only reporting overall prevalence may combine intimate terrorism and situational couple violence, leading to inaccurate representations of the nature and prevalence of different typologies of IPV (Johnson & Leone, 2005). Secondly, this typology enables the development of differential treatment approaches, enhancing the safety and effectiveness of interventions (Bernardi & Day, 2015; Johnson & Leone, 2005). For instance, couples counseling is a common intervention approach, but it would be inappropriate and unsafe for victims of intimate terrorism to disclose information about violence in front of their perpetrators. On the other hand, counseling may be more useful for individuals experiencing situational couple violence, as they can benefit from learning skills to manage emotions and improve conflict resolution abilities. Indeed,

other studies have also shown that different subgroups within IPV may benefit from tailored treatment approaches. For example, a study examining marital IPV and post-separation co-parenting relationships suggested that professionals providing support to women experiencing situational couple violence may need to focus on coaching parents' communication and providing consistent co-parental support (Hardesty et al., 2017). Therefore, it is crucial to apply individualized interventions based on the dynamics and patterns of IPV. By recognizing the heterogeneity within IPV and tailoring prevention and intervention efforts accordingly, we can improve accuracy in prevalence estimation and ensure safe and effective treatment for individuals experiencing different typologies of IPV.

In summary, Johnson's typology of IPV provides us with an important lens through which to understand patterns of IPV. This classification has the potential to enhance the efficacy of prevention and intervention efforts by allowing for tailored approaches to the most vulnerable groups. However, the literature is still limited in terms of our understanding of how IPV changes among pregnant women, particularly over a longer period. In this project, our aim is to explore the experiences of IPV among pregnant women, starting from pre-pregnancy and continuing through the years after childbirth, using Johnson's typology as a framework. Through this research, we hope to gain insights that will facilitate the development of treatments designed to address the specific needs of different groups exposed to IPV, ultimately maximizing the effectiveness of interventions.

3.2 Typology of depression

Not all pregnant women are equally affected by depression. Some women may experience depression during pregnancy and childbirth, while others may have different reactions. To differentiate between different subtypes, it is necessary to employ a longitudinal design that allows for the examination of patterns over time. Previous research has suggested several prototypical patterns of adaptation in response to

stressful events, as depicted in Figure 3-2 (Bonanno et al., 2011; Norris et al., 2009). These patterns include resilience, resistance, recovery, chronic dysfunction, delayed reactions, and relapsing/remitting. By studying these different patterns of adaptation among pregnant women, we can gain a better understanding of their diverse experiences and responses to stressors. This knowledge can inform the development of targeted interventions and support systems that are tailored to the specific needs of women in each subtype. It can also contribute to the overall well-being and mental health of pregnant women by ensuring that appropriate resources and interventions are available to them based on their individual experiences and patterns of adaptation.

a) The resilience pattern refers to individuals who maintain relatively stable and healthy psychological and physical conditions despite being exposed to a highly disruptive event. Resilience is characterized as the ability to adapt and bounce back from stressors rather than being immune to them.

b) The resistance pattern describes individuals who consistently exhibit minimal dysfunction, indicating a relatively stable level of functioning. This pattern differs from resilience, as resistance implies a lack of significant disruption or distress.

c) The recovery pattern involves individuals initially experiencing moderate to severe distress and difficulties due to stressors. However, over time, they gradually return to their baseline level of functioning.

d) The chronic dysfunction pattern is characterized by persistent disruption and dysfunction over an extended period. Individuals in this pattern experience a sustained level of impairment and struggle to regain their previous level of functioning.

e) The delayed pattern refers to individuals who initially exhibit moderate to elevated symptoms in response to stressors. However, instead of immediately worsening,

their symptoms gradually worsen over time, indicating a delayed reaction.

f) The relapsing/remitting pattern displays a cyclical course, where individuals experience periods of improvement and symptom remission followed by relapses or exacerbations of distress. This pattern involves alternating phases of relative stability and increased dysfunction.

Previous empirical studies have provided evidence of various patterns of depression among different populations. For instance, a prospective study in cancer patients identified patterns of depression over 6 years, including increasing depression, chronic depression, depressed-improved, and stable-low depression (Burton et al., 2015). Similarly, in pregnant women, a study utilizing growth mixture modeling analysis identified four distinct patterns of peripartum depression across different trimesters, including the chronic pattern, delayed pattern, recovery pattern, and resistance pattern (Dekel et al., 2019). Another study involving a population-based cohort identified four patterns of postpartum and antepartum depression, including the resilient pattern, improving pattern, emergent pattern, and chronic pattern (Denckla et al., 2018).

Identifying and understanding these changing patterns is crucial as it allows for recognizing individual variability in response to stressful events. These models provide a framework for comprehending different patterns of mental health problems, such as depression, in the face of adversity. By recognizing the presence of these patterns, relevant healthcare settings can establish tailored treatments and interventions that address the specific needs of individuals within each pattern. This personalized approach has the potential to enhance the effectiveness of interventions and improve outcomes for those most in need.

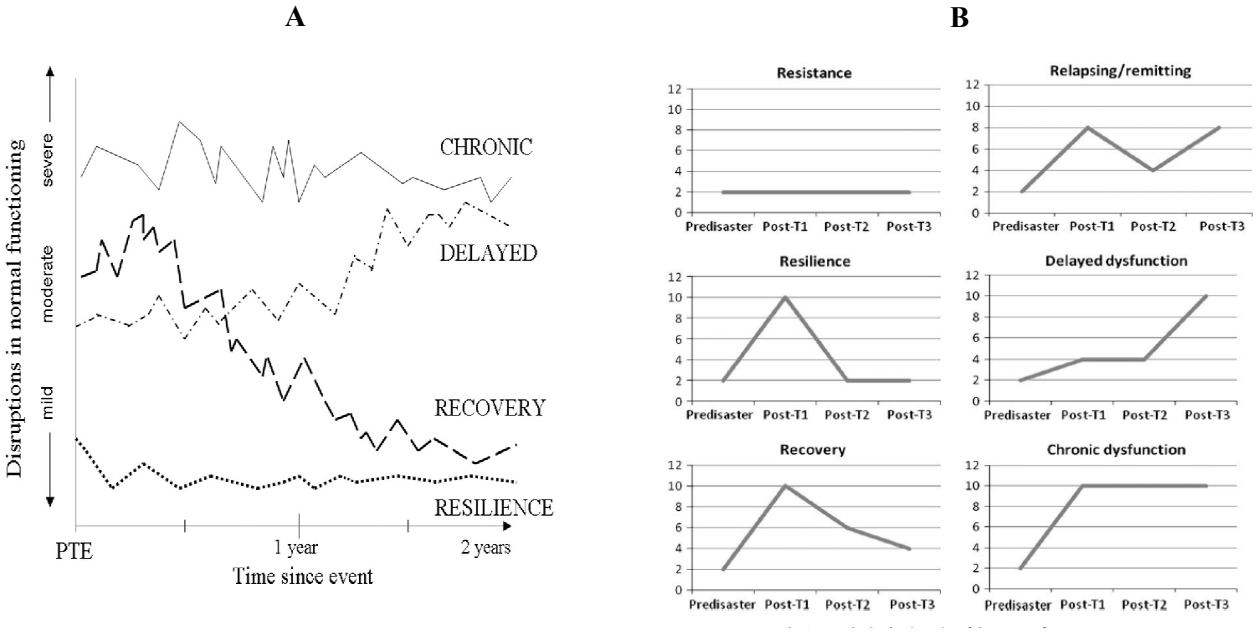


Figure 3-2 Prototypical patterns of stress responses.
Model A is from Bonanno (2011) and Model B is from Norris et al., (2019).

3.3 The public health approach

IPV and depression have significant negative impacts on pregnant women, highlighting the importance of early identification and intervention to mitigate the risk of these problems. The public health approach offers a valuable framework for investigating and understanding the causes and consequences of these issues, as well as implementing primary prevention programs, policy interventions, and advocacy efforts. The objectives of the public health approach include assessing the magnitude of the problems, formulating public policies to address them, and implementing prevention and control measures for the entire population. To achieve these objectives, a four-step public health approach has been developed to prevent violence and other health problems affecting populations (Content source: National Center for Injury Prevention and Control, Division of Violence Prevention).

a) Define and monitor the problem: The first step involves systematically collecting data to understand the magnitude, trends, characteristics, and consequences of violence and mental health problems in the target population. For instance, a state-based surveillance system may gather information from multiple

sources, such as police reports, to collect data on violence-related deaths.

In this dissertation, my primary focus was on two significant public health challenges faced by pregnant women: IPV and depression. These issues not only impact the mothers themselves but also have far-reaching implications for their children. By adopting a public health approach, I aimed to provide a comprehensive framework for investigating the trajectories and causes of these problems. I will further examine their impacts on children's biomarkers of health.

b) Identify risk and protective factors: Understanding the factors that either protect individuals or place them at increased risk for problems is crucial. Identifying these factors goes beyond knowing the magnitude of the problems. For instance, studies have linked individual factors, relationship factors, and social factors to IPV among women in Uganda (Wagman et al., 2013). Similarly, research in Australia has identified significant risk factors for maternal depression during pregnancy, such as a lack of partner support and low socioeconomic status (Ogbo et al., 2018). Understanding these risks and protective factors is essential for prevention efforts.

In this dissertation, I investigated the risk and protective factors associated with various aspects, including ACEs among pregnant women, family support, and partner involvement. My objective was to gain a deeper understanding of how these factors can contribute to different patterns of change in these problems. This comprehensive knowledge can serve as a foundation for the development of more integrated frameworks aimed at addressing the issues of IPV and depression among pregnant women. By utilizing the insights gained from the public health approach, policymakers, healthcare providers, and other stakeholders can collaborate to create holistic approaches that consider the interplay of risk and protective factors. These integrated frameworks can encompass a range of interventions, including early identification and prevention strategies, improved access to mental health services, and support systems for pregnant women. Ultimately, by adopting such

integrated frameworks, we can enhance the effectiveness of interventions and support systems, leading to better outcomes for both mothers and their children.

c) Develop and test prevention strategies: The third step involves developing and testing prevention programs, followed by rigorous assessments of their effectiveness. For example, the CDC's Dating Matters project tests strategies to prevent teen dating violence in urban communities with high crime and economic disadvantage by combining various preventive approaches (Tharp et al., 2011). Similarly, a study found that brief cognitive-behavioral therapy is effective in preventing the manifestation of postpartum depression (Pinheiro et al., 2021).

d) Assure widespread adoption: The final step is to promote the widespread adoption of promising prevention strategies by assessing their effectiveness and impact. Techniques such as training and networking can facilitate the adoption of these programs. Communities are encouraged to evaluate the appropriateness and effectiveness of these strategies in their specific contexts to address the problems.

In this dissertation, it is worth noting that while previous studies have primarily focused on assessing the prevalence of IPV (Shamu et al., 2011) or depression (Sidebottom et al., 2014), there has been relatively less research investigating the longitudinal changes of these issues from pregnancy to subsequent years. Understanding the trajectories of IPV and depression among pregnant women can have significant implications for the prevention and intervention approaches employed. By identifying different subtypes of pregnant women who experience IPV and depression, it becomes possible to tailor interventions to meet the specific needs of each group. For example, conducting assessments to identify subtypes of pregnant women experiencing IPV and depression can help the development of more targeted risk assessment protocols. This would enable healthcare providers to identify individuals who may face a higher risk of persistent or escalating IPV/depression. By recognizing these high-risk subgroups, appropriate interventions can be tailored to meet their specific characteristics and needs. This could

involve adapting existing interventions, exploring alternative therapeutic approaches, or providing additional support services to enhance intervention effectiveness. By implementing these efforts, the aim is to establish a foundation for broader dissemination and scaling-up of effective interventions. The goal is to ensure that the knowledge and approaches developed through ongoing initiatives can be replicated and extended to reach a larger population. Ultimately, the objective is to foster an environment where evidence-based prevention strategies addressing IPV and depression among pregnant women are widely acknowledged, supported, and implemented as standard practice. By laying the groundwork and promoting the scalability of these interventions, we can contribute to improving the overall well-being and health outcomes of pregnant women and their children on a larger scale.

In conclusion, employing the public health approach is highly advantageous for gaining a comprehensive understanding of IPV and depression among pregnant women. This approach enables researchers and practitioners to investigate the longitudinal patterns, risk and protective factors, and biomarkers impact on children associated with these issues. By utilizing the public health approach, it becomes possible to explore these issues in a systematic and integrated manner, leading to the development of more effective prevention and intervention strategies. Ultimately, employing the public health approach can contribute to improving the well-being and outcomes of pregnant women by addressing IPV and depression comprehensively and holistically.

3.4 Chapter summary

This chapter provides a review of two typology theories related to IPV and depression. Johnson's typology of IPV suggests that experiences of IPV can vary greatly, and longitudinal research is necessary to classify different patterns of IPV. Similarly, understanding the changing patterns of mental health problems, such as depression, in response to stressful events is crucial, drawing upon prototypical patterns of stress responses. Furthermore, a comprehensive examination guided by the public health

approach is essential for the development of effective prevention and intervention programs. This includes clear definitions and clarifications of IPV and depression among pregnant women, identification of factors that contribute to risk and protection, and exploration of the health consequences associated with trajectories of IPV and depression. By utilizing typology theories and adopting a public health approach, researchers and practitioners can gain a deeper understanding of the complexities and variations in IPV and depression among pregnant women. This knowledge can inform the development of targeted prevention and intervention strategies that address the unique needs and challenges of this population.

CHAPTER 4: CONCEPTUAL FRAMEWORK, RESEARCH QUESTIONS & HYPOTHESIS

4.1 Conceptual framework

This dissertation builds upon the aforementioned theories to investigate IPV and depression among pregnant women, as well as the risks and protective factors associated with the trajectories of IPV and depression. Additionally, it explores the impacts of these trajectories on subsequent children's TL. Existing work has already provided substantial evidence on IPV and depression during pregnancy and/or the postpartum period. Nevertheless, there are still important questions that require further examination. Therefore, conducting a comprehensive assessment throughout pregnancy, the postpartum, and the follow-up period would provide valuable information for researchers, clinical practitioners, and policymakers. This information can be utilized to develop accurate and tailored prevention and intervention programs specifically designed for pregnant women. Figure 4-1 presents a conceptual framework that serves as a guide for this dissertation.

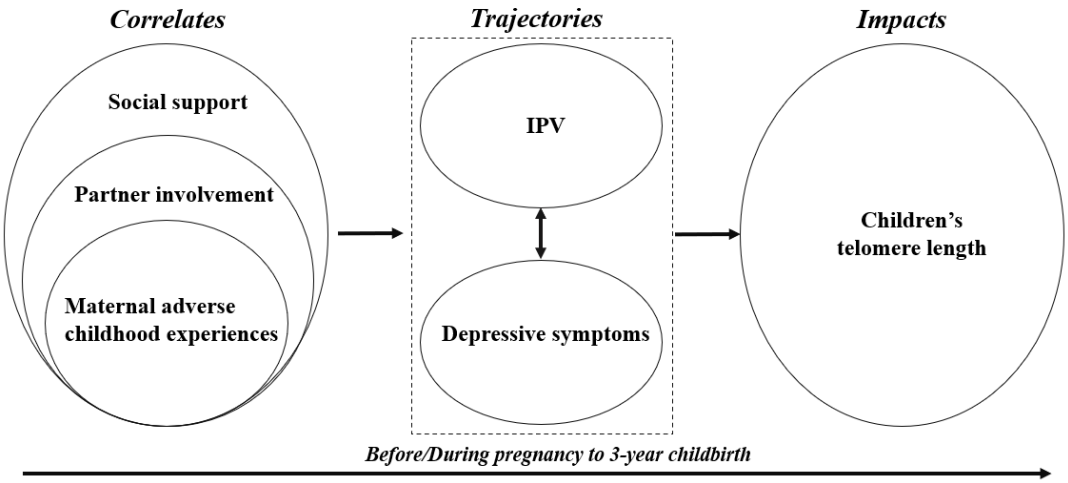


Figure 4-1 The conceptual framework.

4.2 Research questions

This dissertation aims to contribute to the existing knowledge by examining IPV and depression among pregnant women. It focuses on several key aspects, including whether pregnancy acts as a risk factor for IPV and depression, the factors associated with the changing patterns of IPV and depression, the relationship between IPV and depression, and the impacts of trajectories of IPV and depression on children's TL. To guide the study, four research questions are proposed:

Q1: Does pregnancy increase the risk of experiencing IPV?

Q1a: Can pregnancy increase or decrease IPV?

Q1b: Can distinct trajectories of IPV be identified from pre-pregnancy until the follow-up period?

Q1c: Do the proposed risk and protective factors have differential impacts on different trajectories of IPV?

Q2: Does pregnancy increase the risk of developing depression?

Q2a: Can distinct trajectories of depression be identified from pregnancy until the follow-up period?

Q2b: Do the proposed risk and protective factors have differential impacts on different trajectories of depression?

Q3: Can IPV distinguish different trajectories of depressive symptoms in individuals, or vice versa?

Q4: Do different trajectories of IPV and depression have an impact on children's TL?

4.3 Research hypotheses

H1a: Pregnancy does not protect against IPV.

H1b: Pregnant women exhibit diverse trajectories of IPV.

H1c: ACEs increase the risk of being in an abusive IPV relationship, while higher partner involvement and social support reduce the likelihood of reporting abusive IPV experiences.

H2a: Pregnant women exhibit distinct trajectories of depressive symptoms.

H2b: ACEs increase the risk of experiencing increased depressive symptoms, while higher partner involvement and social support decrease the likelihood of reporting an increase in depressive symptoms.

H3: IPV is predictive of increased depression, and depression is predictive of increased IPV.

H4: Women experiencing increased IPV and depression are more likely to have children who have shortened TL.

4.4 Chapter summary

This chapter establishes a conceptual framework and presents four primary research questions. The subsequent chapter will outline a follow-up study conducted with a sample of pregnant women in Hong Kong to address these research questions. Chapter 5 will provide an overview of the study methodology, including details on the study design, data collection procedures, measurement instruments, and data analysis techniques employed. Chapter 6 will present three studies conducted within the research framework. Part One will investigate the trajectories of IPV and their associated factors. Part Two will explore trajectories of depression and their correlates. Both studies one and two will also examine the bidirectional relationships between IPV and depression from a person-centred perspective. Part Three will focus on examining the impacts of the trajectories of IPV and depression on infants' TL. Chapter 7 will discuss how the findings of the study contribute to the existing body of knowledge. Additionally, this chapter will highlight the implications of the research for practice and policy, offering suggestions for the development of prevention and intervention programs within the context of pregnancy care. By following this structure, the dissertation aims to provide a comprehensive examination of the relationship between

IPV and depression among pregnant women, shedding light on the factors associated with these problems, their bidirectional relationship, and the impacts on children's TL. The findings will contribute to the literature and offer practical implications for addressing these issues in the context of pregnancy and infant care.

CHAPTER 5: METHODOLOGY

5.1 Study design and sampling

This dissertation seeks to examine the varying trajectories of IPV and depression throughout the pregnancy continuum. Differentiating between distinct typologies is crucial for providing nuanced insights that can inform prenatal care, allowing for the customization of support to meet the specific needs of each woman. To this end, a three-year longitudinal survey was conducted, following a cohort of pregnant women to chart the progression of IPV and depression from pregnancy through the postpartum phase.

A longitudinal survey was conducted among 1054 pregnant women at Kwong Wah Hospital, a prominent obstetrics and gynecology facility in Hong Kong that handles approximately 5000 births annually. Before participating in our project, these expectant mothers underwent a thorough health assessment by the nursing staff. This evaluation included screening for any serious mental health issues, such as depression. Once this initial process was completed, those identified as being at low risk for mental health complications were approached and asked if they would be interested in participating in our project. The criteria for inclusion in the present study were as follows: (a) being 18 years of age or older, (b) having an understanding of written Chinese, (c) providing informed consent at all periods, and (d) being willing to provide contact information for the follow-up survey.

Three data collection periods were as follows. At Time 1 (T1), which occurred during pregnancy at approximately 20-24 weeks of gestation, these pregnant women provided information on their age, educational attainment, chronic illness, ACEs, history of IPV (both before pregnancy and during pregnancy), and depression. At Time 2 (T2), which occurred approximately 4 weeks after childbirth, the mothers reported any history of IPV after childbirth, depression, partner involvement, and social support. At Time 3 (T3), the aforementioned mothers were approached to report demographic characteristics (i.e., marital status, employment status, receiving social security

assistance, monthly household income, risk behaviors, and chronic illness), any history of IPV, depression, partner involvement, and social support. Additionally, we asked for their consent to include their children in our collection of buccal swab samples. Upon receiving consent, trained researchers contacted the caregivers to collect the child's buccal swab sample following standardized instructions and procedures. The inclusion criterion for this phase was providing informed consent. Detailed designs and sampling of this study can be found in Figure 5-1 as follows.

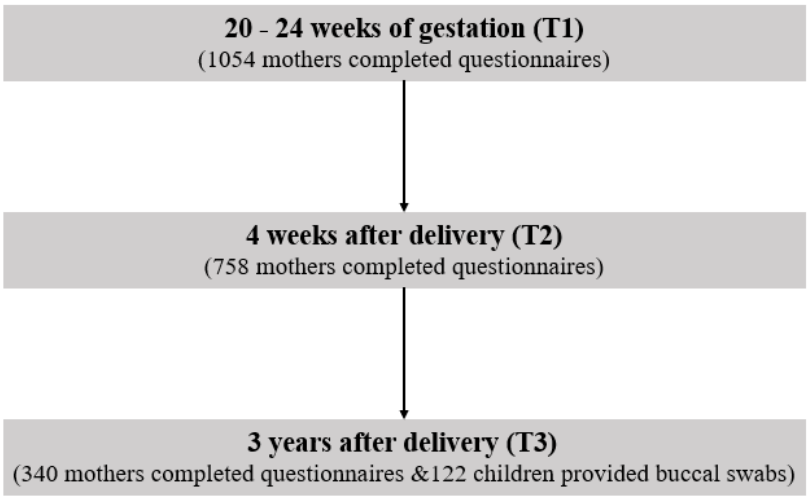


Figure 5-1 Flowchart of participants across T1 to T3.

5.2 Ethical issues and approval

The research ethics were examined and approved by the Institutional Review Board (IRB) of the Hospital Authority Kowloon Central Cluster Research Ethics Committee and the Human Subjects Ethics Sub-committee (HSESC) of The Hong Kong Polytechnic University before the project commences. Ethical approval was obtained from the Institutional Review Board of the sampled hospital. Confidentiality and privacy of all participating families were ensured by a safety protocol. Participants were informed that they could withdraw at any time during the study and ignore any item in the questionnaire.

5.3 Measures

A bulk of survey instruments were employed. A detailed list of measurements can be found in Table 5-3 as follows.

Table 5-3 List of measures

		T1 (20 - 24 weeks of gestation)		**T2 (4 weeks after delivery)**	**T3 (3 years after delivery)**
		Face-to-face interview: recruitment at the first visit to the antenatal clinic		Phone contact: data collection by phone (attempt first)/ web (as alternative)	Similar procedures as T2 did; home visits to collect children's buccal swab samples
Demographic information	Age, education attainment, marital status, employment status, whether they were receiving any social security assistance from the government, monthly household income, and chronic illness	✓			✓
Independent variables	**IPV**	✓ (Before pregnancy)	✓	✓	✓
	Depressive symptoms	✓		✓	✓
Risk and protective factors	**ACEs**	✓			
	Partner involvement			✓	✓
	Social support			✓	✓
Dependent variable	**Children's telomere length**				✓ (Buccal swab samples)

5.3.1 Demographic information

Demographic characteristics were collected at T1 and T3, including age, education attainment, marital status, employment status, whether they were receiving any social security assistance from the government, monthly household income, risk behaviors, and chronic illness (including hypertension, heart disease, asthma, diabetes, nephropathy, cataract, pulmonary tuberculosis, peptic ulcer disease, skin disease, and others).

5.3.2 IPV

IPV experiences were assessed using a modified version of the Abuse Assessment Screen (AAS), which consisted of four items derived from the Chinese version developed by (Tiwari et al., 2007). The scale evaluated participants' experiences of physical assault, psychological aggression, sexual coercion, and fear related to IPV, with respondents providing a "yes" or "no" response. For this study, IPV was defined as physical IPV, psychological IPV, or sexual IPV, while fear due to IPV was excluded from the analysis. The participants were requested to report their experiences of IPV across different periods: before pregnancy (historical IPV occurrences before pregnancy), during pregnancy (from pregnancy until 20-24 weeks gestation), following childbirth (from 20-24 weeks gestation until four weeks postpartum), and over three years (before one year). Participants were categorized as either having experienced IPV (Yes) or not having such experiences (No), based on the definition of IPV employed in a previous publication (Chan et al., 2021). This definition considers any positive response to IPV in any of its forms (physical, sexual, or psychological IPV) as indicative of IPV presence. The Chinese version of the AAS has been found to have satisfactory measurement accuracy in identifying IPV among Chinese women in previous research (Tiwari et al., 2007).

5.3.3 Depressive symptoms

Pregnant women's depressive symptoms were assessed using a 10-item Chinese Edinburgh Postnatal Depression Scale (EPDS) (Lee et al., 1998). Participants were asked to report the presence of depressive symptoms experienced within the past week. Each item was rated on a four-point Likert scale, ranging from 0 (all the time) to 3 (not at all), indicating the frequency of the feelings experienced during the past week. The scores for all items were summed to obtain a total score for depressive symptoms, with higher scores indicating a more severe level of depression. To identify and screen for probable depression, a cut-off score of ≥ 10 was utilized in this study. This cut-off value has been suggested as optimal for screening depressive symptoms during pregnancy and the postpartum period in Chinese mothers (Sha et al., 2019). The Chinese version of the EPDS has been validated in prior studies (Lee et al., 1998). In the present study, Cronbach's alphas for the EPDS were 0.84, 0.83, and 0.81 at T1, T2, and T3, respectively, indicating good internal consistency for the scale at each time point.

5.3.4 Correlates

ACEs

The Adverse Childhood Experiences (ACEs) Questionnaire, as outlined by the World Health Organization (WHO, 2018b), was utilized in this study to identify childhood traumatic events. These events encompassed various categories such as childhood maltreatment, household dysfunction, and exposure to war or collective violence before the age of 18 years. To create an aggregate index, all items from the ACEs Questionnaire were summed together. Previous research has also examined these experiences in Chinese samples (Ho et al., 2019). In the current study, Cronbach's alpha of the ACEs was 0.61.

Partner involvement

Women reported their partner involvement at T2 and T3. Six items were used to rate the level of partner’s involvement in assisting with daily housework (e.g., taking care

of pregnant women's diet), and one item is related to giving emotional support to pregnant women (Chan et al., 2021). These seven items were rated on a 4-point scale from 1 to 4, with higher scores indicating higher involvement. Cronbach's alphas were 0.87 at T2 and 0.90 at T3.

Family Support

Family support levels were measured with the Chinese version of the Multidimensional Scale of Perceived Social Support (MSPSS) (Chou, 2000). Four items were used to evaluate family support. We summed all four items, and a higher score indicated a higher level of family support. Cronbach's alphas were 0.92 at T2 and 0.92 at T3.

5.3.5 Children's buccal telomere length

There are various methods to measure telomere length, including the collection of blood and saliva samples. In the present study, children's buccal telomere length (bTL) was assessed using buccal swab samples. The primary reasons for choosing buccal swab collection as the method for data collection were its status as a common non-invasive technique and its acceptability and ease of operation during data collection, particularly in the context of the COVID-19 pandemic.

Guided by the manufacturer's instructions, genomic DNA samples were isolated and extracted from the collected samples using the QIAamp DNA Mini kit (Qiagen). The following steps were followed:

a) Isolation and extraction of genomic DNA: Genomic DNA samples were isolated and extracted from the collected buccal swab samples using the QIAamp DNA Mini kit (Qiagen). This process was followed by the manufacturer's instructions.
b) Elution and quantification of DNA: The isolated DNA samples were eluted into a buffer solution (10mM Tris-HCl and 1mM ethylenediaminetetraacetic acid, pH 8.0) for quality checking and quantification. This was done using a spectrophotometer (NanoDrop 2000c, Thermo Scientific) to ensure that the DNA quality and quantity

were within an acceptable range for telomere length determination.

c) Telomere length assay: Each DNA sample, determined to be of acceptable quality and quantity, was handled in triplicate for the telomere length assay using quantitative polymerase chain reaction (qPCR). The qPCR was performed using a 7900HT Thermocycler (Applied Biosystems).

d) Calculation of telomere length: After the telomere length assay, the telomere length was determined by calculating the relative ratio of the telomere repeat copy number (T) to the single-copy gene 36B4 copy number (S). The formula used for this calculation was $T/S = 2(-\Delta Ct)$, where ΔCt represents the mean difference between the threshold cycle (Ct) value of the 36B4 gene and telomere repeats obtained from the qPCR. More detailed information about the analysis procedure can be found elsewhere (Chan et al., 2019; Chen, Lo, Chen, Ho, et al., 2024).

5.4 Data analyses

5.4.1 Attrition analyses

Participants who provided data across all three periods were finally included in the data analysis. A T-test was used to compare all the above-mentioned variables between those who completed all surveys and those who quit. These analyses were performed using SPSS 26.0.

5.4.2 Descriptive statistics

Descriptive statistics were shown by distributions or scores of interested variables.

5.4.3 Trajectories of IPV and depressive symptoms

5.4.3.1 Trajectories analysis

Overall trajectories of IPV

To contribute to the debate on whether pregnancy can protect women from IPV, a meta-analysis was conducted to systematically summarize the prevalence of IPV across

different periods, specifically from pre-pregnancy to after childbirth. The meta-analysis followed the standard guidelines for conducting systematic reviews and meta-analyses, known as the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Here is an overview of the methodology, details can be found in the published article (Chen, Lo, Chen, Gao, et al., 2024).

a) Study identification: A comprehensive search was conducted in three electronic databases (PubMed, PsycINFO, and Medline) using a combination of keywords based on previous reviews. The keywords were grouped into three categories: (a) partner violence, domestic violence; (b) trajectory, pattern, path, latent class, typology, change, course, before, during, after; and (c) pregnant, antenatal, prenatal, gestation, postnatal, postpartum, postpartal, perinatal, puerperium, puerperal, childbirth. The different keyword groups were combined using appropriate Boolean operators ("AND" within groups and "OR" between synonymous terms). The search was conducted up to March 2023.
b) Inclusion criteria: Studies were included if they provided sufficient data on the prevalence or rate of IPV among women at three periods: pre-pregnancy, during pregnancy, and after childbirth.
c) Screening and selection: Two researchers independently performed the search and screening process, ensuring adherence to the inclusion criteria.
d) Methodological quality assessment: The Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Prevalence Studies was used to assess the methodological quality of the included studies. This checklist helps evaluate the rigor and quality of the studies.
e) Data extraction: The pooled prevalence of IPV across the three periods was calculated using the raw proportions or percentages reported in the included studies.
f) Statistical analysis: Given the heterogeneity among the included studies, a random-effects model was chosen. This model accounts for variability across studies and provides a more conservative estimate of the prevalence of IPV. Publication bias was assessed using the Egger test and a funnel plot. An asymmetric funnel plot and

a statistically significant Egger test suggest the presence of publication bias. Statistical analyses were conducted using Comprehensive Meta-analysis 3.0 software, and a significance level of $p < 0.05$ was used to determine statistical significance.

Individual trajectories of IPV

The prevalence of IPV was calculated from pre-pregnancy to the 3-year after childbirth. Additionally, different trajectories of IPV were categorized and analyzed. Detailed information can be found in our previously published work (Chen, Lo, Ho, et al., 2022). Here is a summary of the trajectory definitions used in the study:

a) Violent Relationship (VR): A VR was defined as a relationship where individuals experienced any form of IPV consistently throughout the entire period, including from pre-pregnancy to 4 weeks after childbirth and up to 3 years after childbirth. This category includes individuals who reported experiencing IPV at all specified time points.
b) Decreased Violent Relationship (DVR): A DVR was defined as a relationship where IPV was reported from pre-pregnancy to 4 weeks after childbirth but ceased by the 3-year after childbirth. This trajectory indicates a reduction in IPV over time, with the violence ending after the childbirth period.
c) Nonviolent Relationship (NVR): An NVR was defined as a relationship where no IPV experiences were reported across all specified periods, including before pregnancy, during the early postpartum period (up to 4 weeks after childbirth), and in the 3-year after childbirth.

Individual trajectories of depression

The study involved calculating the percentages of depressive symptoms during each period using a cutoff value of 10. Latent Class Growth Analysis (LCGA) was conducted using *Mplus* 7.0 to identify latent classes of depressive symptoms. The approach used in previous research (Shevlin et al., 2023) was followed to estimate the intercepts and

slopes for each latent class. Unconditional models with one to five classes were tested for depressive symptoms. The analysis started with a single-class growth model and progressively increased the number of classes. To determine the optimal number of classes, several criteria were considered (Nylund et al., 2007). These criteria included: (a) Lower information criteria fit indices, such as the Akaike's information criterion (AIC), the Bayesian information criterion (BIC), and the sample-size-adjusted Bayesian (SSBIC). Lower values on these fit indices indicate a better fit of the model. (b) Higher entropy values, which measure the classification accuracy of individuals into latent classes. Higher entropy values indicate better accuracy. (c) Statistically significant *p*-values for both the Lo-Mendell-Rubin likelihood ratio test (LRT) and the bootstrap likelihood ratio test (BLRT). Significant *p*-values suggest that the model with an additional class fits the data better. (d) The theoretical meaningfulness of group memberships, ensuring that the latent classes have interpretability and latent classes with less than 5% of the sample were not considered (Muthén & Muthén, 2000). This article has been accepted to a journal at this stage (Chen, Lo, Wong, et al., 2024).

5.4.4 Logistic regressions

To examine the correlates of different membership clusters related to IPV or depression, logistic regressions were conducted to estimate odds ratios (ORs) and 95% confidence intervals (CIs) (Chen, Lo, Wong, et al., 2024; Chen, Lo, Ho, et al., 2022). The non-risk trajectory was designated as the reference group. Demographic variables, such as educational attainment, and IPV were treated as categorical variables, while other predictor variables, such as social support, were treated as continuous variables. The analysis was conducted in multiple phases, following the approach used in previous work (Chan et al., 2021). Employing multiple phases in the current dissertation is advantageous for a comprehensive understanding of the functions of different phases. Specifically, each phase allows for the exploration of specific dimensions or variables, contributing to a more holistic understanding of the research question. In this dissertation, two phases were examined. In the first phase, demographic variables were

included as independent variables. In subsequent phases, each of the other predictor variables was individually added to the model, while controlling for demographics. All statistical analyses were performed using SPSS 26.0.

5.4.5 Linear regressions

To investigate the predictive impact of different trajectories of IPV and depression on children's bTL, linear regression analysis was employed (Chen, Lo, Chen, Ho, et al., 2024). The primary analyses involved two steps: testing crude models and adjusted models. In the crude models, the independent variable was different patterns of IPV and depression. The dependent variable was TL. This analysis examined the direct association between trajectory memberships and TL, without considering other factors. In the adjusted models, ACEs and chronic illness were included as continuous variables. By including ACEs and chronic illness as continuous variables in the analysis, the study aims to examine how these factors may interact with the trajectory membership in predicting TL. This allows for a more comprehensive understanding of the complex relationship between IPV, depression, ACEs, chronic illness, and TL in children.

5.4.6 Chapter summary

The current chapter presents an overview of the methodologies employed in this 3-year project, which aims to address several research questions. These questions include investigating whether pregnancy is a risk factor for IPV and depression, exploring the relationships between IPV and depression during pregnancy and after childbirth, and examining the potential differential impacts of different IPV and depression trajectories on children's TL. To answer these research questions, a comprehensive set of methods was designed, drawing upon the literature. The adopted methods were specifically tailored to test the research hypotheses and offer valuable insights into the topics being investigated. The methodologies employed in this project mainly encompass a longitudinal study design. By utilizing a range of methodologies, this project aims to generate robust findings and contribute to the existing knowledge in the field. The

research design and methods chosen are expected to provide valuable insights into the complex relationships between pregnancy, IPV, depression, and children's TL, shedding light on the potential risk factors and impacts associated with these variables.

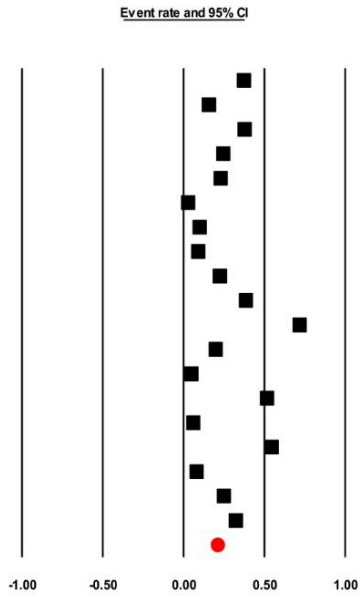
CHAPTER 6: FINDINGS

6.1 Overall trajectories of IPV using meta-analysis

To capture the overall trajectories of IPV and synthesize previous inconsistent results, a meta-analysis was conducted. In the meta-analysis, 6770 records were identified. A total of 19 articles that met the study eligibility criteria were included. The quality assessment scores of these studies ranged from 5 to 9, indicating moderate to high quality (Chen, Lo, Chen, Gao, et al., 2024).

The pooled prevalence of IPV was examined at different time points. Results as shown in Figure 6.1a found a decrease in the prevalence of IPV during pregnancy (12.8%) compared to the pre-pregnancy period (21.2%). Moreover, the prevalence of IPV increased from 12.8% within the first year after childbirth to 24.0% beyond the first year. This suggests a significant rise in IPV rates as the postpartum period progresses. Figure 6.1b illustrates the trend of IPV rates over time (Chen, Lo, Chen, Gao, et al., 2024).

Study name	IPV pooled prevalence	Statistics for each study				
		Event rate	Lower limit	Upper limit	Z-Value	p-Value
Abota et al., 2022	Before pregnancy	0.374	0.348	0.401	-8.970	0.000
Brown et al., 2012	Before pregnancy	0.157	0.138	0.179	-21.175	0.000
Chan et al., 2012	Before pregnancy	0.378	0.336	0.422	-5.337	0.000
Chan et al., 2021	Before pregnancy	0.246	0.221	0.272	-15.896	0.000
Chen et al., 2022	Before pregnancy	0.229	0.188	0.277	-9.394	0.000
Cizmeli et al., 2018	Before pregnancy	0.028	0.023	0.035	-30.445	0.000
Faisal-Cury et al., 2013	Before pregnancy	0.100	0.080	0.124	-17.454	0.000
Guo et al., 2004	Before pregnancy	0.091	0.086	0.096	-72.649	0.000
Hatcher et al., 2021	Before pregnancy	0.225	0.189	0.265	-11.166	0.000
Hedin, 2000	Before pregnancy	0.386	0.307	0.472	-2.588	0.010
Islam et al., 2018	Before pregnancy	0.718	0.674	0.759	8.691	0.000
Kothari, 2014	Before pregnancy	0.199	0.158	0.248	-9.637	0.000
Martin et al., 2001	Before pregnancy	0.049	0.041	0.058	-32.836	0.000
Mohammadhosseini et al., 2010	Before pregnancy	0.517	0.460	0.573	0.577	0.564
Muldoon et al., 2021	Before pregnancy	0.060	0.035	0.101	-9.606	0.000
Salazar et al., 2009	Before pregnancy	0.545	0.496	0.594	1.802	0.072
Scribano et al., 2013	Before pregnancy	0.081	0.076	0.086	-69.042	0.000
Serpeloni et al., 2019	Before pregnancy	0.250	0.181	0.335	-5.211	0.000
Silva et al., 2011	Before pregnancy	0.324	0.295	0.354	-10.667	0.000
		0.212	0.143	0.303	-5.369	0.000



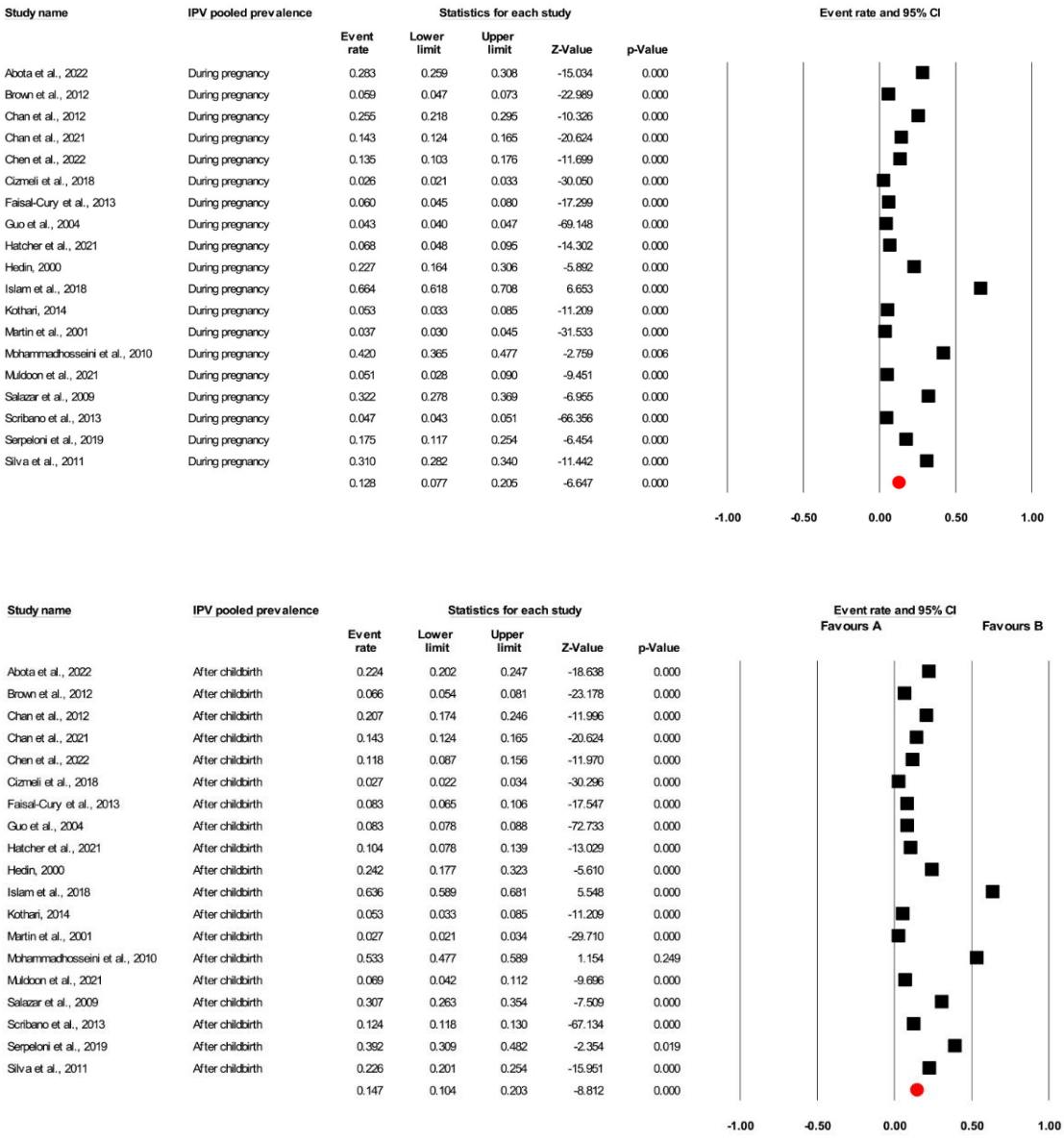


Figure 6.1a IPV prevalence at different periods

(Chen, Lo, Chen, Gao, et al., 2024)

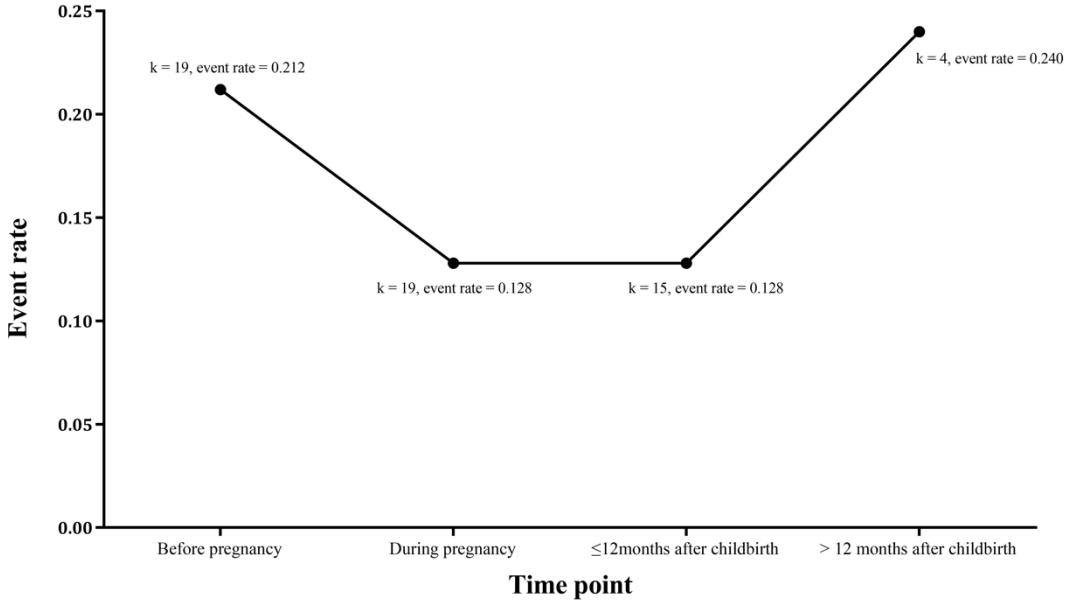


Figure 6.1b IPV prevalence from before pregnancy to after childbirth (Chen, Lo, Chen, Gao, et al., 2024)

To assess the potential publication bias, a funnel plot and Egger's tests were conducted. The funnel plot (Figure 6.1c) displayed a symmetrical distribution of studies, indicating no significant publication bias. Furthermore, Egger's tests did not reveal any evidence of publication bias, as the *p*-value was greater than 0.05. Details can be found in the articles (Chen, Lo, Chen, Gao, et al., 2024).

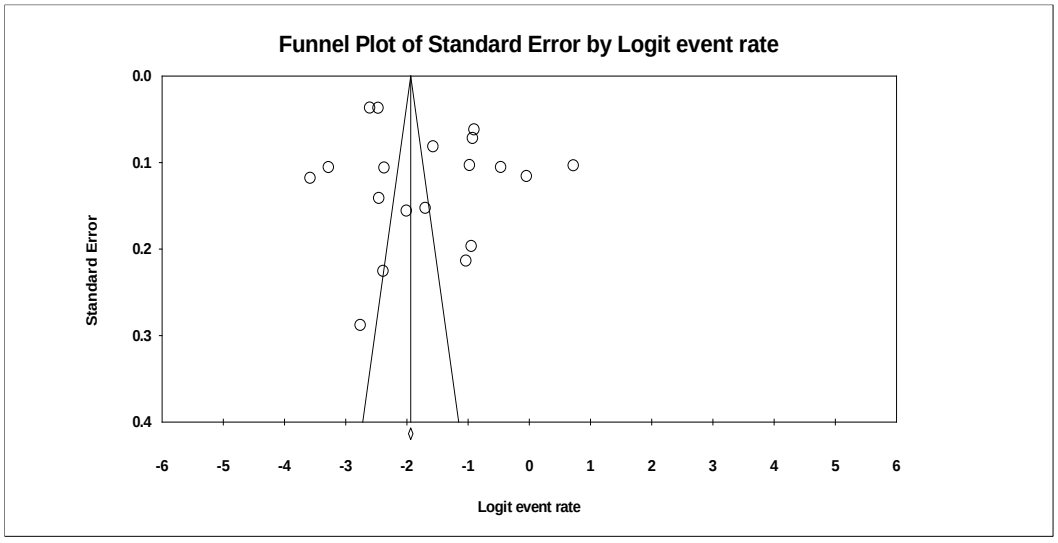


Figure 6.1c Funnel plots of publication bias (Chen, Lo, Chen, Gao, et al., 2024)

6.2 Part one: Trajectories of IPV and its correlates

6.2.1 Trajectories of IPV using a 3-year cohort study

Demographic characteristics of participants

A total of 340 participants completed assessments in all three periods. The average age of participants who completed all assessments was 31.30 years old, with a standard deviation of 4.26. Further details regarding participant characteristics and demographic information can be found in Table 6.2.1.

Table 6.2.1 Demographic characteristics of 340 pregnant women

Variables	N (%) / Mean (SD)
Age at baseline (mean, SD)	31.30 (4.26)
Education attainment (n, %)	
Lower secondary or below	44 (12.9)
Upper secondary	104 (30.6)
College/university or above	192 (56.5)
Marital status T3 (n, %)	
Widow/separated/ divorced	25 (7.4)
Married	315 (92.6)
Employment status T3 (n, %)	
Unemployment	118 (34.7)
Employment	222 (65.3)
Receiving social security assistance T3 (n, %)	
Yes	12 (3.5)
No	328 (96.5)
Monthly household income T3 (n, %)	
Less than HKD15,000	32 (9.4)
HKD15,000 to HKD39,999	132 (38.8)
HKD40,000 or above	176 (51.8)
Risk behaviors T3 (n, %)	
Yes (gambling, smoking, or drinking)	29 (8.5)
No	311 (91.5)
Chronic illness T3 (n, %)	
Yes	36 (10.6)
No	304 (89.4)
ACEs (mean, SD)	2.79 (2.08)
Daily housework T2 (mean, SD)	18.59 (3.35)

Daily housework T3 (mean, SD)	20.78 (4.16)
Emotional support T2 (mean, SD)	3.28 (0.61)
Emotional support T3 (mean, SD)	3.36 (0.83)
Family support T2 (mean, SD)	23.65 (4.28)
Family support T3 (mean, SD)	23.34 (4.58)
Depression, CEPDS (mean, SD)	
T1	6.98 (4.50)
T2	4.31 (4.15)
T3	4.25 (4.46)

Note. T1 = during pregnancy; T2 = 4 weeks after childbirth; T3 = 3 years after childbirth. SD = standard deviation. CEPDS = Chinese Edinburgh Postnatal Depression Scale; ACEs = adverse childhood experiences.

To investigate the missing mechanism and potential biases in the data, a comparison was conducted between the participants who completed all assessments and those who dropped out. The results revealed several differences between the two groups. Firstly, women who had data for all three assessment periods reported a higher prevalence of IPV and higher ACEs compared to those who dropped out (Chen, Lo, Ho, et al., 2022). This suggests that participants who experienced higher levels of IPV and ACEs were more likely to remain engaged in the study. Additionally, it was observed that the participants who dropped out had a higher level of education compared to those who completed all assessments. This indicates that individuals with higher education levels may have been more prone to dropping out of the study.

The prevalence of IPV across periods

Most women experienced psychological IPV (22.1% before pregnancy,13.5% during pregnancy, 14.1% after 4-week childbirth, and 11.2% after 3-year childbirth). Women reported less physical/sexual abuse ranging from 0.6% to 3.8%. 22.9% of women reported any IPV before pregnancy, 13.5% reported any IPV during pregnancy, 14.7% reported any IPV 4 weeks after childbirth, and 11.8% reported any IPV 3 years after childbirth (Chen, Lo, Ho, et al., 2022).

Individual trajectories of IPV using a 3-year cohort study

In our study, the prevalence of IPV was examined across different periods, including pre-pregnancy to 4 weeks after childbirth and up to 3 years after childbirth. Based on the data, three distinct groups were identified (Figure 6.2.1) (Chen, Lo, Ho, et al., 2022):

a) VR group (violent relationship group): Among the women surveyed, 11.8% reported experiencing chronic IPV persistently from pre-pregnancy to 3 years after childbirth. This group represents women who consistently reported IPV all the time.

b) DVR group (decreased violent relationship group): Approximately 20.6% of women reported a decrease in IPV over time.

c) NVR group (nonviolent relationship group): The majority of women, comprising 67.6%, did not report any experiences of IPV from pre-pregnancy to 4 weeks after childbirth and up to 3 years after childbirth.

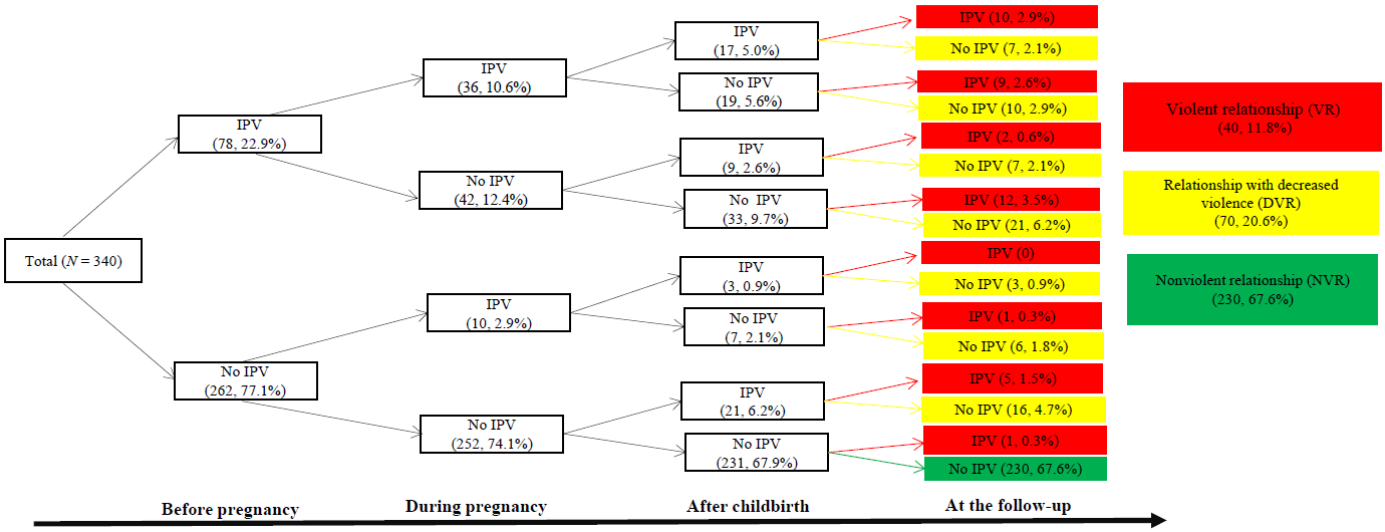


Figure 6.2.1 Trajectories of IPV among pregnant women from pre-pregnancy to three years after childbirth

6.2.2 Correlates of trajectories of IPV

We then processed two-phase ordinal logistic regressions to examine the associations between the demographic variables, partner involvement, social support, ACEs, depressive symptoms, and IPV trajectories. Results are shown in Table 6.2.2 (Chen, Lo, Ho, et al., 2022). In phase 1, receiving social security assistance was associated with an

increased chance of experiencing more severe IPV (OR = 6.52, 95% CI = 1.98, 21.50). In phase 2, after adjusting for the variables from phase 1, higher partner involvement and higher family support could protect women from experiencing severe IPV. Pregnant women reporting ACEs were associated with a higher possibility of having severe IPV experiences (aOR = 1.25, 95% CI = 1.12, 1.39). Furthermore, depression at all three periods (aOR = 1.06 at T1, 1.08 at T2, and 1.07 at T3) was associated with an increased likelihood of the dependent variable, indicating that higher depressive symptoms were related to an increased chance of experiencing more severe IPV.

Table 6.2.2 Multiphase ordinal logistic regression of correlates on IPV trajectories

Variables	Crude ORs	Adjusted ORs
Phase 1		
Age at baseline	1.00 (0.94, 1.05)	
Education attainment		
Lower secondary or below	0.91 (0.41, 2.00)	
Upper secondary	1.33 (0.76, 2.34)	
College/university or above	Ref.	
Marital status		
Widow/separated/ divorced	1.03 (0.42, 2.54)	
Married	Ref.	
Employment status		
Unemployment	0.63 (0.36, 1.09)	
Employment	Ref.	NA
Receiving social security assistance		
Yes	**6.52 (1.98, 21.50)****	
No	Ref.	
Monthly household income		
Less than HKD15,000	1.13 (0.43, 2.98)	
HKD15,000 to HKD39,999	1.31 (0.76, 2.26)	
HKD40,000 or above	Ref.	
Risk behaviors		
Yes (gambling, smoking, or drinking)	1.00 (0.43, 2.30)	
No	Ref.	
Chronic illness		
Yes	1.22 (0.59, 2.55)	
No	Ref.	

Phase 2 (Variables individually added, adjusted for demographics)		
Partner involvement		
Daily housework T2	**0.91 (0.85, 0.97)****	**0.91 (0.85, 0.97)****
Daily housework T3	1.03 (0.97, 1.08)	1.02 (0.96, 1.08)
Emotional support T2	0.72 (0.50, 1.04) *p = 0.077*	**0.69 (0.48, 1.00)** *p = 0.055*
Emotional support T3	0.90 (0.69, 1.18)	0.85 (0.64, 1.13)
Family support		
Family support T2	**0.93 (0.88, 0.98)****	**0.91 (0.87, 0.96)*****
Family support T3	**0.94 (0.90, 0.99)***	**0.95 (0.90, 1.00)***
ACEs	**1.25 (1.13, 1.40)*****	**1.25 (1.12, 1.39)*****
Depression, CEPDS		
T1	**1.07 (1.02, 1.12)****	**1.06 (1.01, 1.12)***
T2	**1.07 (1.02, 1.13)****	**1.08 (1.03, 1.14)****
T3	**1.07 (1.02, 1.12)****	**1.07 (1.01, 1.12)***

Note. T1 = during pregnancy; T2 = 4 weeks after childbirth; T3 = 3 years after childbirth. NVR = nonviolent relationship; DVR = decreased violent relationship; VR = violent relationship. The dependent variable was IPV trajectories. It was ordinal: the threshold estimate "1" was the cut-off value between "nonviolent relationship" (NVR) and "decreased violent relationship" (DVR). The threshold estimate "2" was the cut-off value between "decreased violent relationship" (DVR) and "violent relationship" (VR). ACEs = adverse childhood experiences. CEPDS = Chinese Edinburgh postnatal depression scale. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

6.3 Part two: Trajectories of depression and its correlates

6.3.1 Prevalence of depressive symptoms

To assess potential attrition bias, we conducted a t-test to compare the mean differences in depressive symptoms at each assessment period between participants who completed all assessments and those who did not. The results indicated that there were no significant differences between these two groups at any wave. This suggests that attrition is unlikely to be associated with depressive symptoms. Additionally, we used a cut-off score of ≥10 to identify probable depression. The prevalence of depressive symptoms was 26.5% at T1, 9.7% at T2, and 12.6% at T3 (Chen, Lo, Wong, et al., 2024).

6.3.2 Trajectories of depression

We employed Latent Class Growth Analysis (LCGA) to identify different classes of women based on the dynamic changes in depressive symptoms from pregnancy to 3 years after childbirth. Table 6.3.2 presents the information criterion indices, which decreased from the one-class solution to the five-class solution. However, the three-class, four-class, and five-class solutions resulted in very small groups, comprising approximately 2% of the sample. This does not meet the criteria for determining the number of latent classes, as suggested by a previous study (Marsh et al., 2009). Therefore, the two-class model was selected for further analysis (Chen, Lo, Wong, et al., 2024).

Table 6.3.2 Fit indices for one- to five-class unconditional models for depressive symptoms

Fit indices	**1-Class**	**2-Class**	**3-Class**	**4-Class**	**5-Class**
AIC	5946.34	5905.17	5886.26	5850.73	5846.48
BIC	5965.48	5935.80	5928.38	5904.34	5911.58
SSBIC	5949.62	5910.42	5893.48	5859.93	5857.65
Entropy	-	0.83	0.86	0.89	0.90
LRT *p* value	-	0.07	0.35	0.02	0.48
BLRT *p* value	-	<0.001	<0.001	<0.001	0.04
Smallest class, %	-	13.8%	1.5%	1.5%	0.6%

Note: AIC: Akaike information criterion; BIC: Bayesian information criterion; SSBIC: sample size adjusted Bayesian information criterion; LRT: LoeMendelleRubin test; BLRT: bootstrap likelihood ratio test.

Examining the class-specific course trajectories in the two-class model (Figure 6.3.2), we observed that the first class exhibited a trajectory characterized by consistently low symptom ratings across all time points. This class was labeled as "the low-stable group," with 86.2% of women classified in this group. The second class displayed fluctuating depressive symptoms, demonstrating a cyclical course over time. This class was identified as "the relapsing/remitting group," with 13.8% of women classified in this group (Chen, Lo, Wong, et al., 2024).

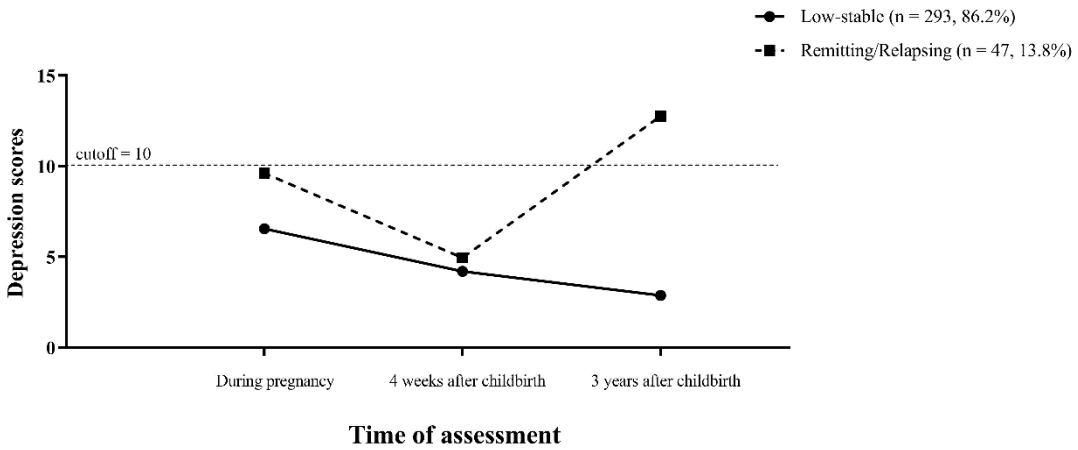


Figure 6.3.2 Trajectories of depressive symptoms across three-time points among women (Chen, Lo, Wong, et al., 2024)

6.3.3 Correlates of trajectories of depression

We conducted binary logistic regressions to identify correlates of latent class membership. As shown in Table 6.3.3, the low-stable group was designated as the referent class and compared with the relapsing/remitting group (Chen, Lo, Wong, et al., 2024). The likelihood of developing relapsing/remitting depressive symptoms if the women reported chronic health problems (OR = 2.81, 95% CI = 1.18, 6.70), higher ACEs (aOR = 1.18, 95% CI = 1.02, 1.38), higher IPV at T2 (aOR = 2.31, 95% CI = 1.02, 5.20) and at T3 (aOR = 2.72, 95% CI = 1.17, 6.31). Partner involvement, particularly in the form of emotional support, can protect women from experiencing relapsing or remitting depressive symptoms.

Table 6.3.3 Logistic regressions of correlates on depressive trajectories

Variables	**Remitting/Relapsing vs. Low-stable**	
	Crude ORs	**Adjusted ORs**
Phase 1		
Age at baseline	0.99 (0.92, 1.06)	
Education attainment		
Lower secondary or below	0.46 (0.14, 1.50)	
Upper secondary	1.22 (0.56, 2.65)	
College/university or above	Ref.	
Marital status		
Widow/separated/ divorced	1.46 (0.46, 4.68)	

Married	Ref.	
Employment status		
Unemployment	1.21 (0.58, 2.53)	NA
Employment	Ref.	
Receiving social security assistance		
Yes	0.70 (0.11, 4.30)	
No	Ref.	
Monthly household income		
Less than HKD 15,000	2.60 (0.80, 8.48)	
HKD 15,000 to HKD 39,999	1.56 (0.71, 3.42)	
HKD 40,000 or above	Ref.	
Risk behaviors		
Yes (gambling, smoking, or drinking)	2.57 (0.96, 6.86)	
No	Ref.	
Chronic illness		
Yes	**2.81 (1.18, 6.70)***	
No	Ref.	
Phase 2 (Variables individually added, adjusted for variables in Phase 1)		
Partner involvement		
Daily housework T2	1.01 (0.93, 1.11)	1.01 (0.92, 1.11)
Daily housework T3	0.97 (0.90, 1.05)	0.96 (0.89, 1.04)
Emotional support T2	**0.57 (0.35, 0.92)***	**0.59 (0.36, 0.97)***
Emotional support T3	**0.68 (0.47, 0.99)***	**0.61 (0.41, 0.91)***
Family support		
Family support T2	0.99 (0.93, 1.07)	0.99 (0.92, 1.07)
Family support T3	**0.88 (0.83, 0.94)*****	**0.88 (0.83, 0.94)*****
ACEs	**1.16 (1.01, 1.34)***	**1.18 (1.02, 1.38)***
IPV pre-pregnancy		
Yes	1.52 (0.77, 3.01)	1.55 (0.76, 3.18)
No	Ref.	Ref.
IPV T1		
Yes	1.64 (0.73, 3.66)	1.45 (0.61, 3.48)
No	Ref.	Ref.
IPV T2		
Yes	**1.99 (0.94, 4.23)** $p=0.07$	**2.31 (1.02, 5.20)***
No	Ref.	Ref.
IPV T3		

Yes	**2.37 (1.07, 5.24)***	**2.72 (1.17, 6.31)***
No	Ref.	Ref.

Note. T1 = during pregnancy; T2 = 4 weeks after childbirth; T3 = 3 years after childbirth. ACEs = adverse childhood experiences. IPV = intimate partner violence.

6.4 Part three: Impacts of the IPV and depression trajectories on children's telomere length

In Part Three, we conducted linear regressions to investigate the potential impact of IPV trajectories on children's telomere length. Regarding the IPV trajectories, we designated the nonviolent relationship as the reference group for comparison. The results showed that there were no significant differences in children's telomere length between women in the decreased violent relationship group (β = -0.02, 95% CI = -0.07, 0.05) and the nonviolent relationship group. Similarly, no significant differences were found in infants' telomere length between women in the violent relationship group (β = 0.03, 95% CI = -0.07, 0.09) and the nonviolent relationship group.

Next, the study examined the impact of different depressive symptom trajectories on children's telomere length (Chen, Lo, Chen, Ho, et al., 2024). The low-stable depressive trajectory group was considered as the reference group. The results revealed that children whose mothers were in the remitting/relapsing depressive group were more likely to have shorter telomere length compared to the low-stable group (β = -0.19, 95% CI = -0.14, -0.005). This finding suggests that the fluctuating course of depressive symptoms experienced by mothers was associated with shorter telomere length in their children. Furthermore, when adjusting for the severity of chronic illness, the relationship between the remitting/relapsing depressive group and shorter telomere length remained significant. Additionally, when adjusted for ACEs, the predictive effects of the "remitting/relapsing" depressive symptoms increased and the influence of ACEs positively predicted children's TL. The results remained significant after adjusting for both ACEs and the severity of chronic illness. Details can be found in

Table 6.4 (Chen, Lo, Chen, Ho, et al., 2024).

Table 6.4 Predictive effects of maternal health (psychological and physical) on children's TL using linear regressions ($N = 122$)

	Model 1: Crude associations	Model 2: Adjusted for ACEs	Model 3: Adjusted for chronic illness	Model 4: Adjusted for ACEs and chronic illness
	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
Depressive symptoms trajectories				
Low-stable depressive symptoms	Ref.	Ref.	Ref.	Ref.
Relapsing/remitting depressive symptoms	**-0.19 (-0.14, -0.005)***	**-0.24 (-0.16, -0.02)***	**-0.19 (-0.14, -0.001)***	**-0.23 (-0.16, -0.02)***
ACEs	0.13 (-0.003, 0.02)	**0.19 (0.00, 0.02)***	-	**0.19 (0.001, 0.02)***
Chronic illness T1[a]	-0.07 (-0.07, 0.03)	-	-0.03 (-0.06, 0.04)	-0.04 (-0.06, 0.04)
Adjusted *R*-Squared	-	0.05	0.02	0.05
F	-	4.44 ($p < 0.05$)	2.30 ($p > 0.05$)	3.02 ($p < 0.05$)

Note. T1 = during pregnancy. [a] $N = 121$ because of one missing data. *$p < 0.05$.

CHAPTER 7: DISCUSSION

7.1 Summary of findings

This dissertation utilized a meta-analysis and 3-year longitudinal design to investigate whether pregnancy can serve as a protective factor against IPV and depressive symptoms in women. The findings from the three studies enhance our comprehension of distinct patterns of IPV and depressive symptoms, as well as their associated factors and impacts on children's TL. In accordance with the hypotheses, the corresponding results are summarized as follows:

Q1: Does pregnancy increase the risk of experiencing IPV?
Q1a: Can pregnancy increase or decrease IPV?

Results of the meta-analysis showed that the prevalence estimates of IPV were 21.2% before pregnancy, 12.8% during pregnancy, and 14.7% after childbirth. These findings suggest a decrease in IPV during pregnancy compared to before pregnancy. However, additional analysis revealed that this decrease is not sustained over time. IPV rose to 24.0% beyond the first year of pregnancy.

As reviewed in the Introduction, the literature presents inconsistent results regarding whether pregnancy acts as a risk or protective factor against IPV for women. One potential methodological issue that contributes to these discrepancies is the variation in the timeframes examined across different studies. Estimating the continuity of IPV before, during, and after pregnancy is critical for accurately assessing IPV prevalence (Chan et al., 2021). The current meta-analysis included articles that reported data for these three distinct periods, and we found a reduction in IPV during pregnancy compared to its prevalence before and after pregnancy as some previous studies found (Chan et al., 2021). However, it is important to interpret these findings with caution as we did not have data on the changes in different types of IPV over time, and it is possible that IPV does not cease during pregnancy. The literature suggests that while physical manifestations of IPV may attenuate during pregnancy, other less visible forms, such as emotional IPV, may persist (Islam et al., 2018). Indeed, Silva and colleagues found that emotional IPV is more prevalent during pregnancy, while physical violence

decreases (Silva et al., 2011). This could be attributed to the perpetrators' reluctance to engage in physical and sexual violence due to potential harm to the baby (Van Parys, Deschepper, et al., 2014). It is important to note that despite the absence of obvious signs of IPV such as physical violence, emotional violence can have serious consequences, such as maternal depression during pregnancy (Alan Dikmen & Tetikçok, 2023) and a reluctance to breastfeed (Martin-de-las-Heras et al., 2019). Additionally, IPV can manifest in other less apparent forms, such as controlling behaviors (Garcia-Moreno et al., 2006), which pregnant women have also reported (McKelvie et al., 2020). In summary, despite the observed decrease in IPV during pregnancy, it cannot be assumed that pregnancy protects against IPV, as less visible IPV may still occur (Chen, Lo, Chen, Gao, et al., 2024). Furthermore, there is a gradual increase in IPV after childbirth, highlighting the importance of continued screening and support for women during the postpartum period.

Q1b: Can distinct trajectories of IPV be identified from pre-pregnancy until the follow-up period?

The findings from Part One revealed that women's experiences of IPV over time varied. Different women had different trajectories of IPV during and after pregnancy. In our study, approximately 12% of women reported persistent IPV from pregnancy to 3 years after childbirth. These distinct patterns of IPV among pregnant women provide empirical evidence supporting the notion that violent relationships can be heterogeneous, with multiple patterns occurring (Johnson & Leone, 2005). The present study extends the literature (Chan et al., 2021; Islam et al., 2018) by utilizing a 3-year longitudinal design, which enhances our understanding of the trajectory of IPV over a longer term. Our evidence of IPV from pregnancy to 3 years after childbirth has important implications for healthcare providers. It highlights that IPV can persist for several years. For instance, a 10-year cohort study found that 3.5% of women experienced physical IPV and 9.0% experienced emotional IPV at the ten-year postpartum (Fogarty et al., 2023). Therefore, it is crucial for healthcare providers to screen for violence during pregnancy and immediately after childbirth to prevent future IPV. However, it is insufficient to limit screening to only these periods. Our study, along with the literature, emphasizes the critical importance of long-term screening that extends beyond the immediate postpartum period to protect the well-being of women

and their babies. Healthcare providers should be equipped to identify and address IPV throughout the entire postpartum period and beyond. This comprehensive approach can help ensure the safety and support of women experiencing IPV and contribute to the overall well-being of families.

Q1c: Do the proposed risk and protective factors have differential impacts on different trajectories of IPV?

Another critical aspect addressed in Part One was understanding the correlates of IPV to identify women at risk and develop prevention and treatment strategies. Regarding protective factors, higher levels of family support and partner involvement were found to buffer against IPV. These findings align with the buffering model of social support (Cohen & McKay, 1984). According to this model, individuals with limited support are more susceptible to negative consequences of stressful events, while those with stronger support systems are better equipped to cope and recover. Individuals with higher social support may have a greater sense of purpose and control, enabling them to construct more adaptive narratives around stressful events and mitigate their negative impacts (Zhou et al., 2018). However, it should be noted that social support may not be effective when individuals experience a high level of accumulated stress. For instance, a nationally representative study found that social support alone is insufficient for youth facing overwhelming adverse experiences (Pan et al., 2020).

In terms of risk factors, women who had higher levels of ACEs were at a greater risk of experiencing long-term IPV. This finding is consistent with a systematic review that indicated the negative impact of ACEs on IPV among Chinese women (Cao et al., 2021). Several theories help explain the role of ACEs in shaping future violent relationships. The self-trauma model suggests that adverse experiences can affect an individual's development through various mechanisms. These mechanisms include distorting cognitive understandings of self and others and influencing coping strategies, which can subsequently impact intimate relationships (Briere, 1996). The target vulnerability theory posits that certain personal characteristics can render individuals more vulnerable to victimization (Finkelhor & Asdigian, 1996). These characteristics may include physical weakness, psychological distress, and traits that may arouse anger, resentment, or jealousy in perpetrators. Maltreated individuals may develop feelings of

inferiority, being unlovable, and helplessness, making them more susceptible to revictimization and becoming easy targets for IPV (Li et al., 2019). Social learning theory proposes that children may perceive abusive interactions as a normative way to resolve conflicts through observational learning. This can lead to the normalization of violence in intimate relationships (Bandura & Walters, 1977; Ehrensaft et al., 2003).

It is important to recognize that the risk of ACEs on IPV may be cumulative, meaning that the more ACEs an individual experiences, the higher the likelihood of experiencing IPV in the future (Young-Wolff et al., 2019). A population-based study in Brazil found that women classified under the "multiple ACEs" category had a 4.3 times higher risk of experiencing IPV compared to those in the "low ACEs" category (Buffarini et al., 2022). Another important concern is the intergenerational transmission of violence. Some studies have found that IPV against pregnant women increases the risk of postnatal child maltreatment. A longitudinal population-based study conducted in Hong Kong found that IPV during pregnancy was associated with a higher risk of both lifetime and preceding-year child physical abuse (Chan et al., 2012). Similar findings were observed in a recent follow-up study in Japan (Kita et al., 2019). These findings, in conjunction with the results of our study, emphasize the critical importance of addressing past traumatic events to break the cycle of violence.

Q2: Does pregnancy increase the risk of developing depression?

Q2a: Can distinct trajectories of depression be identified from pregnancy until the follow-up period?

In Part Two, we examined the trajectories of depressive symptoms in women from pregnancy through three years post-childbirth and identified the factors associated with these trajectories. We used a cutoff value of 10 to classify depressive symptoms based on the literature and found that 26.5% of women reported experiencing depression during pregnancy. However, this prevalence decreased to 9.7% after 4 weeks following childbirth but showed a slight increase after three years. To analyze the trajectories, we employed LCGA and identified two distinct groups. Most women (86.2%) belonged to a group characterized by consistently low depressive symptoms throughout the three years, referred to as the "low-stable" group. On the other hand, 13.8% of women exhibited a pattern of relapsing and remitting depression, forming the

"relapsing/remitting" group. These findings align with previous research indicating a decrease in depressive symptoms from pregnancy to 4 weeks after childbirth. A meta-analysis reported a prevalence of antenatal depression in China at 19.7%, while postnatal depression was reported at 14.8% (Nisar et al., 2020). The researchers suggested that antenatal depression may spontaneously recover after childbirth in some women. However, it is important to note that rates of depression tend to increase over a longer period. Another meta-analysis found that studies with durations longer than 12 months had a higher prevalence of depression compared to shorter-term studies (e.g., 4 weeks to 3 months) (Wang et al., 2021). These results emphasize the significance of conducting long-term follow-ups with women after childbirth to assess whether depressive symptoms rebound over time. Such knowledge can inform the development of targeted interventions and support programs to address the mental health needs of women during the postpartum period and beyond.

The two groups of women were distinguished using Latent Class Growth Analysis (LCGA), with the majority demonstrating consistently low levels of depressive symptoms throughout the examined period. This finding is consistent with existing work. For instance, a longitudinal study conducted with women residing in Cape Town settlements followed up at multiple time points (2 weeks, 6 months, 18 months, and 36 months postpartum) and found that a substantial proportion (71.1%) of women reported experiencing persistent low depressive symptoms throughout the postpartum period (Garman, Cois, et al., 2019). Similar results were also observed in another study where 74.3% of women belonged to the low-stable group (Rinne et al., 2022). Additionally, 13.8% of women exhibited remitting/relapsing depressive symptoms over time. These women experienced a reduction in depressive symptoms from pregnancy to the immediate postpartum period (i.e., 4 weeks postpartum). However, over a more extended follow-up period (i.e., 3 years after childbirth), their depressive symptoms worsened. This may be attributed to factors such as the temporary overshadowing of postpartum stressors by the excitement of having a newborn infant (referred to as the "honeymoon period") (Parade et al., 2014). Subsequently, the cumulative impact of stressors over time could contribute to the deterioration of depressive symptoms, including potential stressors such as IPV, as we will discuss further. It is noteworthy that other studies have identified additional trajectories, such as chronic depression

(Kiviruusu et al., 2020). Inconsistencies in results across studies may stem from differences in sample characteristics, follow-up intervals, and durations (Choi et al., 2022).

These findings indicate that while a significant number of women experience a reduction in depressive symptoms following childbirth, a minority continues to experience fluctuations in their depressive symptoms over the three years. Understanding these diverse trajectories and the factors associated with them can provide valuable insights for developing targeted interventions and support systems for women dealing with postnatal depression. By tailoring interventions to address the specific needs of women in different trajectory groups, healthcare professionals and support providers can offer more effective and personalized support to promote mental well-being during the postpartum period.

Q2b: Do the proposed risk and protective factors have differential impacts on different trajectories of depression?

In Part Two, we conducted an additional analysis of the correlates associated with remitting/relapsing depression. Initially, we observed that women with chronic health complications faced a higher risk of developing depression. This aligns with a meta-analysis that supports our findings, indicating that women with chronic physical conditions are at a heightened risk of mental illness during or after pregnancy (Brown et al., 2018). The elevated vulnerability of women with chronic physical conditions to perinatal mental illness can be attributed to two assumptions (Brown et al., 2019). Firstly, the perinatal period represents a significant life transition, and women with chronic physical conditions may encounter heightened psychosocial stressors related to disease management. Secondly, these women may face challenges associated with pre-existing diseases or obstetrical complications, which can increase the likelihood of mental health issues, particularly exacerbated during the perinatal period. Moreover, women with higher ACEs were more prone to experiencing remitting/relapsing depression. The detrimental impact of a history of abuse on the development of depression has also been documented in the literature (Abe et al., 2022; Hou et al., 2020). This highlights the long-lasting effects of adverse childhood experiences on mental health outcomes, including a higher risk of experiencing depressive symptoms

during the perinatal period and beyond.

Social support emerges as a crucial factor in protecting women from the onset of remitting/relapsing depressive symptoms. Specifically, family support serves as a buffer for women, with numerous studies providing evidence for its protective effects (Cho et al., 2022; Qi et al., 2022; Taylor et al., 2022). Intriguingly, a prior study indicated that the quality, rather than the quantity, of social support predicts lower levels of psychological distress (Shang et al., 2019). Although beyond the scope of the present work, it is recommended that future studies thoroughly explore this issue to gain a deeper understanding of the impact of social support on remitting/relapsing depression. Additionally, partner involvement, particularly emotional involvement, has been found to reduce the risk of experiencing remitting/relapsing depressive symptoms, as supported by the literature highlighting the positive influence of partner involvement (Chan, 2019). Taken together, these findings underscore the importance of social support, including family support and partner involvement, in protecting women from remitting/relapsing depression. Future interventions and support programs should consider strategies to enhance social support networks and promote meaningful partner involvement to improve mental health outcomes for women during and after pregnancy.

Q3: Can IPV distinguish different trajectories of depressive symptoms in individuals, or vice versa?

This study suggests that experiencing IPV after childbirth, rather than before or during pregnancy, is a stronger predictor of remitting/relapsing depression. This finding underscores the potential influence of interventions at different stages to address these issues. It is also implied that distal stressors may affect mental health through more immediate minority stressors (Hatzenbuehler, 2009; Mason et al., 2016), although this aspect was not explored in the current study. Future research could further investigate this topic to gain a deeper understanding of the pathways through which distal stressors affect mental health.

Moreover, maternal depressive symptoms can differentiate various trajectories of IPV. This finding aligns with individual studies that have demonstrated an association between depressive symptoms and IPV (Connelly et al., 2013; Rodriguez et al., 2020)

and a meta-analysis revealing a 5.46-fold increased risk of postpartum depression among women exposed to intimate partner violence (Desta et al., 2021). The current study provides a nuanced framework that further supports the notion that depressive symptoms are more likely to predict chronic violent relationships compared to women who do not report violence. It is crucial to make efforts to distinguish different trajectories of IPV and depressive symptoms, as well as explore the bidirectional relationship between the two, in order to effectively target interventions, particularly by focusing on high-risk groups. By understanding the interplay between depressive symptoms and IPV, interventions can be tailored to address the specific needs of women experiencing these co-occurring challenges, ultimately promoting their well-being and safety.

Q4: Do different trajectories of IPV and depression have an impact on children's TL?

The findings of this study indicate that different trajectories of IPV do not have an impact on children's subsequent TL. Prior research has yielded mixed results regarding the association between maternal adverse experiences and children's TL (Chan et al., 2019; Naudé et al., 2023). The reasons for these discrepancies remain unclear, but it is possible that variations in time measurements and study designs have influenced the results (Naudé et al., 2023). For example, in a cohort of 111 mother-child pairs, higher levels of maternal perceived stress during the third trimester of pregnancy were predictive of shorter child buccal TL (β = -0.24) (Carroll et al., 2020). Several additional considerations need addressing. Firstly, it is crucial to note that different types of IPV may have varying effects on children's TL. A follow-up study involving 774 pregnant women in Hong Kong found that psychological abuse against women before childbirth (β = -0.08) and sexual abuse against women before childbirth (β = -0.22) were significantly associated with reduced newborn TL (Chan et al., 2019). Unfortunately, due to limited sample sizes, our study was unable to separate the types of IPV and examine different trajectories for each type. Future research is recommended to contribute to this important topic and provide a more nuanced framework. Secondly, an important factor not assessed in our study is the severity of IPV, which may influence the results. It is known that more severe and chronic abuse can have a greater toll on maternal and child health (Silverman et al., 2006). Using a subset of the UK Biobank (N = 144,049), researchers discovered a dose-response pattern between the number of

IPV types experienced and TL. Specifically, individuals who experienced all three types of IPV had the shortest TL (β = -0.07), followed by those who experienced two types (β = -0.04) (K. L. Chan et al., 2023). Lastly, it is worth mentioning that the relatively small sample sizes in our study may have limited the power to detect different predictive effects. In summary, it is crucial to consider the potential differential effects of different types of IPV and different severity on children's TL. Conducting more extensive longitudinal studies with sufficient data will provide a more comprehensive understanding of how IPV, including its timing, severity, and types, affects the health and development of children.

Regarding remitting/relapsing depressive symptoms, children whose mothers experience these symptoms over time are more likely to have shorter TL. Shorter telomeres have been observed in several psychiatric conditions, particularly depression (Price et al., 2013). Empirical studies have supported the association between maternal depressive symptoms and children's TL (Enlow et al., 2018), although others have not found a significant relationship (Ämmälä et al., 2020; Beijers et al., 2020). The chronicity of prenatal psychological adversities may influence the magnitude of the effects on the offspring's TL (Rentscher et al., 2020). To gain a more nuanced understanding of this topic, the present study employed a three-year longitudinal design to differentiate between different trajectories of depressive symptoms. However, our current study was unable to further explore the potential effects of other factors such as the sex of the fetus (Enlow et al., 2018; Garcia-Martin et al., 2021) due to a limited sample size. Therefore, we recommend that future studies with larger sample sizes be conducted to investigate these factors. Meanwhile, when considering the impacts of the severity of maternal ACEs, the predictive effects of remitting/relapsing depressive symptoms increased, while the predictive effects of ACEs became positive. It is possible that mothers with ACEs were more likely to experience the risk of depressive symptoms, which in turn shortened children’s TL. Indeed, a meta-analysis has found ACEs put women at risk for depressive symptoms during the pregnancy and postpartum periods (Racine et al., 2021). Moreover, a national and longitudinal cohort study conducted in the United States demonstrated that mothers who had a partner incarcerated were more prone to experiencing depression when their children were between the ages of 9 and 15. Additionally, an increase in maternal depression was

associated with more accelerated telomere length shortening among children during this period (Del Toro et al., 2021). The associations between maternal ACEs, depressive symptoms, and offspring's TL were not tested because of limited sample sizes. Future studies are recommended to address this topic. Furthermore, the lack of significant findings between maternal chronic illness and children's TL might be attributed to the characteristics of the sample. In particular, the pregnant women included in the study were relatively young and had a low prevalence of chronic illnesses (most women reported having only one or none). Additionally, the samples used in the study were non-clinical, which may have been insufficient to detect the influence of chronic illness on TL. Further research is necessary to investigate whether there are differences between clinical and non-clinical samples in terms of the effects of chronic illness, to provide more targeted support.

In summary, the findings suggest that children whose mothers experience recurring episodes of depressive symptoms over time may have shorter TL. However, the relationship between maternal depressive symptoms and children's TL is not consistently supported across studies. The duration and persistence of prenatal psychological adversities may play a role in the magnitude of these effects. To gain a more comprehensive understanding of this topic, further research with larger sample sizes is needed. It is also important to explore other potential factors, such as the sex of the fetus, that may influence the relationship between maternal depressive symptoms and children's TL. Additionally, examining the associations between maternal adversity, including different types and severity of IPV and ACEs, and the pathways through which ACEs affect children's TL, are crucial. Finally, investigating subgroups of pregnant women with different characteristics, such as those with chronic illnesses, would help to assess the impact of these factors on children's TL.

7.2 Implications

Implications for future research, practice, and policy in the field of pregnancy and perinatal care should prioritize raising awareness about the pressing public concerns related to IPV and depression. It is crucial to acknowledge that women are vulnerable

to experiencing violence and depressive symptoms from pregnancy through the postpartum years. This awareness should serve as a guide for developing comprehensive interventions, implementing effective practices, and establishing supportive policies aimed at addressing these issues and promoting the well-being of pregnant women and their families.

7.2.1 For research

Future studies are recommended to collect data on IPV and depressive symptoms over multiple years postpartum. Firstly, there is an urgent need for continued support for maternal mental health (Hentges et al., 2020). Identifying the "sensitive period" of depression is crucial for offering tailored and effective support to mothers. By collecting data over an extended period, researchers can gain a better understanding of the long-term effects of depressive symptoms and identify optimal intervention timing. Secondly, our meta-analysis findings indicate that IPV tends to increase over a longer timeframe, extending beyond 12 months after childbirth. This suggests that measuring short-term IPV immediately after childbirth may not provide a complete picture and could lead to misleading conclusions that IPV ceases after childbirth. To comprehensively explore the correlates, trajectories, and impacts of IPV and depressive symptoms, longer follow-up studies are essential.

Secondly, future research needs to investigate whether there are changes in the forms of IPV during pregnancy. As mentioned earlier, the decreased prevalence of IPV during pregnancy could potentially be attributed to changes in the forms of IPV experienced by pregnant women. However, there is a lack of comprehensive studies that have thoroughly examined these changes. By investigating the shifts in the forms of IPV during pregnancy, researchers can provide a more accurate and nuanced understanding of IPV dynamics among pregnant women. This research can help identify specific types of IPV that may be more prevalent or develop different patterns during pregnancy. Understanding these changes is crucial for the development of targeted interventions

and support services that address the unique needs and challenges faced by pregnant women experiencing IPV.

Finally, future research should consider following children to gather data on their physiological, psychological, and social development. Existing work indicates significant predictive IPV during pregnancy on early postnatal child maltreatment (Chan et al., 2012; Kita et al., 2019). A 10-year longitudinal study has revealed that any maternal exposure to IPV from infancy to age 10 was associated with poorer child outcomes at age 10, including a probable psychiatric diagnosis, emotional/behavioral difficulties, impaired language skills, and consultations with health professionals about asthma or sleep problems (Gartland et al., 2021). A meta-analysis demonstrated that children of mothers with prenatal and/or postnatal depressive symptoms had an increased risk of death in the first year of life and a higher risk of hospitalization (Jacques et al., 2019). There is a limited number of studies that longitudinally explore the different trajectories of IPV and depressive symptoms and their long-term consequences for children. In the present study, our focus was on exploring the different impacts of maternal trajectories of IPV and depressive symptoms on children's TL. However, due to limited sample sizes, we were unable to evaluate other child mental health problems and biomarkers. Therefore, we recommend conducting more studies with sufficient sample sizes to further explore these topics and investigate the various trajectories of IPV and depressive symptoms and their potential effects on future child outcomes.

7.2.2 For practice

Firstly, our synthesized findings reveal that IPV decreased during pregnancy but increased gradually after childbirth, particularly over the long term. A similar trend was observed for depressive symptoms: depressive symptoms decreased from pregnancy to 4 weeks after childbirth but increased at 3 years postpartum. These findings highlight the significance of regular screening for both violent victimization and depression

before, during, and after pregnancy. It is important to note that screening should not be limited to the current pregnancy alone, as there is a risk of recurrence of these issues.

Pregnancy provides a crucial opportunity to identify women who may be experiencing IPV and depressive symptoms, and prenatal care plays a significant role as a venue for screening. Healthcare providers are in a prime position to screen women who are at the highest risk of IPV and depressive symptoms. However, despite endorsements from healthcare organizations and agencies, not all women receive this screening, even within the context of prenatal care provision (Clark et al., 2000; Martin et al., 2006). Therefore, more intensive efforts are needed to strengthen screening practices. One potential approach to improving screening practices is the implementation of midwifery-led continuity of care (MCoC). This care model involves a known midwife or a small team of known midwives providing comprehensive care for women and babies throughout the perinatal period. MCoC is a preventative intervention that reduces maternal mental health issues during this crucial period (Cibralic et al., 2023). By adopting this model, healthcare systems can enhance the identification of IPV and depressive symptoms and provide tailored support to women in need. Furthermore, postnatal healthcare visits are another important opportunity to provide support to victims of IPV. By incorporating targeted interventions during these visits, healthcare providers can enhance the quality of care and reduce the impact of IPV on maternal and neonatal health (Mazza et al., 2021). It is crucial to ensure that these visits include screening for IPV and adequate resources to support women who disclose experiencing violence.

In addition to screening, it is crucial to provide interventions and treatments to support women in recovering from IPV and depressive symptoms. One comprehensive approach that has shown effectiveness in understanding the impact of traumatic events on health outcomes is trauma-informed care (TIC) (Substance Abuse & Mental Health Services Administration, 2014). Obstetrical providers are in a prime position to deliver

TIC (Drexler et al., 2021). Programmatic examples of TIC in maternity care settings have demonstrated promising results (Gerber, 2019). Furthermore, home visiting programs and behavioral counseling interventions have the potential to address multiple risk factors and reduce IPV among pregnant or postpartum women. However, more research is needed to determine the effectiveness of interventions aimed at preventing IPV during the perinatal period (Van Parys, Verhamme, et al., 2014). It is important to acknowledge that there are barriers to implementing these interventions, including the need for culturally sensitive adaptations and healthcare professionals to be attentive to cultural sensitivity when communicating with pregnant women (Henriksen et al., 2021). Further research is needed to fully establish the benefits of existing intervention programs (Feltner et al., 2018).

Depression is indeed a treatable condition, and it is understandable that pregnant and lactating women may have concerns about using antidepressants due to potential impacts on their children (Putnick et al., 2023). As a result, nonpharmacological treatments such as cognitive-behavioral therapy (Shortis et al., 2020) and physical exercise programs (Vargas-Terrones et al., 2018) are often preferred by women for managing their depressive symptoms. Taking a comprehensive approach from both preventive and interventional perspectives is crucial. In terms of prevention, collaboration between psychologists and physicians is essential in identifying depressive symptoms among pregnant women and understanding their risk factors (Alves et al., 2023). Early diagnosis and appropriate guidance allow for a multidisciplinary approach, preventing the worsening of mild conditions. Clinical practitioners should be attentive to pregnant women during their initial appointments, and follow-up sessions should include ongoing guidance and identification of depressive symptoms throughout postpartum care. Technology-based interventions, such as electronic health interventions for mental health, have gained acceptance among parents due to their accessibility, anonymity, usability, and supportive nature (Attard et al., 2022). Empirical studies have demonstrated their potential in improving maternal

mental health and fostering family support for pregnant women (Chan & Chen, 2019). Additionally, maintaining a healthy dietary pattern has been found to reduce perinatal depression (Silva et al., 2019). For instance, a prospective cohort study conducted in Taiwan interviewed 300 women from a medical center during late pregnancy and at 4-6 weeks postpartum, revealing that higher omnivorous pattern scores were associated with a reduced risk of depression (L. C. Chan et al., 2023). Encouraging women to adopt a healthy dietary pattern during pregnancy may contribute to better mental health outcomes.

Thirdly, it is crucial to acknowledge that women may experience diverse trajectories of IPV and depressive symptoms over time. Therefore, generic prevention and intervention programs for IPV and depressive symptoms among pregnant women, which assume that all women are equally at risk of victimization, may not be sufficient to provide individualized support. Given the emergence of different trajectories of IPV and depressive symptoms, it is imperative to explore tailored interventions and services for each specific group. However, there is a lack of research on specific interventions for these different trajectories, highlighting the need for more evidence-based approaches that can accurately address the varying needs of women. Furthermore, it is important to recognize that specific types of IPV may impact prenatal care utilization differently, although this goes beyond the scope of the current findings. For example, women who experience physical abuse may be more likely to require emergency services during pregnancy for their injuries, rather than seeking preventative care. On the other hand, women experiencing psychological abuse may have different needs and may require specific types of support and interventions (Jamieson, 2018).

Fourthly, it is important to carefully consider various significant risk and protective factors in practice. One notable risk factor is a history of trauma, which has been identified as increasing the likelihood of experiencing IPV and depressive symptoms. Adopting a trauma-informed care (TIC) approach becomes crucial in recognizing and

responding appropriately to the impacts of trauma. Some scholars advocate for the inclusion of adverse childhood experiences in nursing curricula to enhance practitioners' understanding of potential underlying factors contributing to IPV and depression (Gill et al., 2019). Conversely, protective factors play a pivotal role in mitigating the risks associated with IPV and depression. Strategies that emphasize family support and partner involvement, particularly in providing emotional support, can shield women from violent relationships and alleviate depressive symptoms. It is essential to encourage men to understand women's vulnerabilities during pregnancy and the postpartum period, as this fosters collaboration, strengthens couples, and helps prevent abusive behaviors or violence (Mazza et al., 2021). Family-based counseling has demonstrated effectiveness in reducing various forms of violence against women by enhancing couples' awareness and improving their relationships during pregnancy. For example, an intervention trial in Iran provided counseling sessions for pregnant women and their spouses based on the Greeting, Ask, Tell, Help, Explain, and Refer (GATHER) principles. The study revealed that family-oriented counseling significantly deterred all forms of violence against women, highlighting its impact on increasing couples' awareness and improving relationships during pregnancy (Babaheidarian et al., 2021). Furthermore, the For Baby's Sake whole-family approach is a promising program that engages parents from pregnancy to two years postpartum to break cycles of domestic violence and enhance children's outcomes. This approach focuses on ending domestic violence, addressing intergenerational cycles of violence and abuse (including the impact of parents' own childhood experiences of adversity), and aims to improve parents' mental health, infants' emotional and social development, and parent-child attachment outcomes (Trevillion et al., 2020). In conclusion, considering risk factors such as trauma history and implementing protective factors like family support and partner involvement are crucial in practice. The integration of trauma-informed care, family-based counseling, and comprehensive programs such as For Baby's Sake can contribute to addressing intimate partner violence and depression during pregnancy, promoting healthier family dynamics, and improving overall well-being outcomes for

women and children.

Lastly, it is crucial for healthcare professionals to be well-informed about the relationship between IPV and depressive symptoms to effectively screen for both conditions. This may involve integrating IPV screening into routine prenatal care and ensuring the availability of adequate mental health services for those in need. Moreover, professionals working with abused women, such as staff at domestic violence programs, should undergo training to assess for depression and other mental health issues, including post-traumatic stress disorder. This comprehensive approach ensures that women who have experienced IPV receive the necessary services. Similarly, mental health specialists should routinely screen female patients for violence and offer appropriate services to those identified as victims. Achieving this requires a multidisciplinary approach, where care providers are trained to address both mental health and violence issues. It is essential to integrate routine prenatal IPV screening with depression screening to ensure a holistic assessment of women's needs. In conclusion, the integration of routine prenatal IPV screening with depression screening is essential, and healthcare professionals should receive cross-training in both mental health and violence issues to provide comprehensive care to women who have experienced IPV. By addressing both IPV and depressive symptoms, healthcare providers can better support and assist women in their journey toward healing and well-being.

7.2.3 For policy

Policies designed to address IPV and depression among pregnant women should prioritize several key aspects. Firstly, policymakers should actively promote the establishment of collaborative relationships between agencies and communities to deliver comprehensive health and safety services for pregnant women. This necessitates coordinated efforts among healthcare providers, social service agencies, law enforcement, and community organizations, ensuring a holistic approach to addressing

IPV and promoting mental health. Practice and policy should facilitate easily navigable services across health, social, and legal sectors, fostering a "no wrong door" attitude (Ghandour et al., 2015).

Secondly, policymakers should endorse and support ongoing IPV education programs for frontline healthcare providers, particularly nurses. Equipping healthcare professionals with knowledge and skills related to IPV and depression enables them to better identify and respond to cases, implement appropriate prevention measures and intervention programs, and offer necessary support to pregnant women.

Thirdly, policies should advocate for the implementation of standardized screening protocols for IPV and depression in prenatal care settings. This includes providing guidelines for healthcare providers to routinely screen pregnant women for signs of violence and depressive symptoms, along with establishing clear referral pathways to ensure that women receive the necessary support and intervention services.

Fourthly, policymakers should strive to enhance legal and justice system responses to IPV throughout the perinatal period. This involves ensuring that laws and regulations offer sufficient protection for pregnant women and fostering collaboration between healthcare providers and legal authorities to ensure the safety and well-being of pregnant women in abusive situations.

In conclusion, effective policies addressing IPV and depression during pregnancy require collaborative partnerships, education and training programs, standardized screening protocols, and a supportive legal and justice system. Through the implementation of comprehensive policies, policymakers can contribute to the prevention, identification, and intervention of IPV and depression among pregnant women, ultimately promoting their health and safety, as well as the overall well-being of their families.

7.3 Limitations

The present studies have pioneered research on IPV and depressive symptoms among pregnant women, providing valuable insights into prenatal and postnatal care through a 3-year longitudinal design. However, it is important to acknowledge certain limitations when interpreting our results. Firstly, the use of self-report questionnaires may have introduced reporting bias. Participants might have responded in a manner that aligns with social desirability or subjective perceptions, potentially impacting the accuracy of the reported data. Secondly, the sample size of the study was relatively small due to the impact of the COVID-19 pandemic during data collection. This limited sample size may have affected our ability to identify different trajectories of IPV and depressive symptoms accurately. Therefore, future studies with larger and more diverse samples are recommended to validate and expand upon our findings. Thirdly, our study lacked data on family or personal histories of depression, as well as information on the specific trimesters of pregnancy about IPV and depression. This prevented us from assessing whether trajectories of IPV and depressive symptoms varied according to these factors. Including such data in future research would enhance an understanding of these associations. Fourthly, the present study measured telomere length exclusively using buccal cells. While a prior study has indicated that telomere lengths from various cell types within the same individual are positively correlated (Lin et al., 2010), it is advisable for future research to include multiple cell types to corroborate the findings of the current study. Lastly, it is important to note that our sample exclusively consisted of pregnant women. As a result, caution should be exercised when generalizing these findings to other populations, as the experiences and outcomes related to IPV and depressive symptoms may differ in diverse demographic groups.

7.4 Conclusion

Pregnancy represents one of the most significant stages in a woman's life, marked by profound physical and hormonal changes that can render them vulnerable to health and social challenges. IPV and depressive symptoms, experienced by pregnant women, are

two of the most serious public health problems, as they not only impact their well-being but also have implications for their children's outcomes. Employing a comprehensive and integrated framework guided by the public health approach and typologies of IPV and depressive symptoms, the empirical results of these studies offer a more nuanced and accurate depiction of whether pregnancy acts as a risk or protective factor for IPV and depressive symptoms. Part One was groundbreaking in consolidating and synthesizing inconsistent findings, offering a comprehensive overview of whether pregnancy increases or decreases IPV. Moreover, it delved into whether all women experience similar trajectories of IPV by collecting data from pre-pregnancy to post-childbirth, along with their associated factors. Part Two focused on investigating different trajectories of depressive symptoms and their correlates among pregnant women. The relationship between IPV and depressive symptoms was also examined in Parts One and Two from a person-centered perspective. Part Three examined the predictive effects of different trajectories of IPV and depressive symptoms on subsequent children's TL. Based on these research findings, implications for future research, practice, and policy were discussed.

Screening for IPV and depressive symptoms throughout the perinatal period, extending to years after childbirth, is crucial for tracking the trajectories of different women. Longitudinal studies with extended follow-up periods are needed to explore the long-term impacts of IPV and depressive symptoms. Frontline obstetric care workers are well-positioned to play a key role in this regard, providing routine screenings for IPV and depressive symptoms, offering counseling and support services, facilitating referrals to specialized professionals or resources, implementing evidence-based interventions, and ensuring follow-up care. It is also imperative for policymakers to recognize the seriousness of these two intractable public health problems and collaborate with various agencies to provide necessary support for women at risk of experiencing IPV and depressive symptoms during pregnancy and the postpartum period. Additionally, there is a critical need to develop more effective and targeted

intervention programs based on the implementation framework of public health. These programs should consider the unique challenges and needs of pregnant women experiencing IPV and depressive symptoms. By addressing the root causes, providing early identification and intervention, and offering comprehensive support, these programs can help protect pregnant women and enhance the well-being of the entire family and society as a whole. In conclusion, screening, intervention, and support for IPV and depressive symptoms among pregnant women should be integrated into perinatal care. Policymakers, healthcare providers, and various agencies need to collaborate to ensure the availability of comprehensive services and implement evidence-based interventions. By doing so, we can work towards protecting the health and well-being of pregnant women and promoting healthier outcomes for families and communities.

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