CAREGIVER-CHILD RELATIONSHIP AND TEEN TOBACCO USE FROM THE SAMPLE OF THE FUTURE OF FAMILY AND CHILD WELLBEING STUDY: A MEDIATED ANALYSIS

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CAREGIVER-CHILD RELATIONSHIP AND TEEN TOBACCO USE FROM THE SAMPLE OF THE FUTURE OF FAMILY AND CHILD WELLBEING STUDY: A MEDIATED ANALYSIS (110 pp.)

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Studies consistently show that strong caregiver-child relationships, positive parent-child communication, and parental monitoring reduce the likelihood of tobacco use. However, the specific protective mechanism through which this critical family processes for example, parental communication (father-child and mother-child dyad), and parental monitoring within caregiver-child relationships and how they affect teen tobacco use, with particular attention given to gender-specific differences is limited. Guided by family systems theory, this study examined how caregiver-child relationships, parental monitoring, and parent-child communication interplay influence the tobacco use of teenagers. This study used data from the year 15 follow-up from the Future of Family and Child Wellbeing Study (FFCWS) to assess the mediation role of parental monitoring and parent-child communication (Father-child and mother-child dyad) on the relationship between the caregiver-child relationship and teen tobacco use. Lastly, I examined the gender-specific difference in the impact of father-child and mother-child communication on teen tobacco use. The results indicated that caregiver-child relationships were found to predict teen

tobacco use. Also, parental monitoring was found to mediate the relationship between caregiver-child relationship and teen tobacco use. On the contrary, parent-child communication was not found to mediate the relationship between caregiver-child relationships and teen tobacco use. However, variation existed in the gender-specific difference in the effect of father-child and mother-child communication in influencing teen tobacco use. Mother-child communication appears to have a more significant effect compared to father-child communication. These results provide evidence in support of prevention and intervention programs aimed at reducing teen tobacco use and promoting positive caregiver-child relationships.

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CHAPTER I

INTRODUCTION

The prevalence of tobacco use among teenagers is a matter of concern for public health. It has been observed that 80% of young individuals start using tobacco before they reach the age of 18. This habit is linked to adverse health consequences, such as respiratory and cardiovascular diseases, cancer, and addiction (CDC, 2014; National Institute on Drug Abuse NIDA, 2020; Bruns & Lee, 2020). If this pattern persists, it is projected that around six million children under the age of 18 will suffer premature deaths as adults due to their teenage tobacco use (CDC, 2022). The habit of smoking during adolescence not only elevates the risk of various health issues but also results in long-term effects such as cognitive impairment and psychiatric disorders (Mokdad et al., 2018; Nazir et al., 2019; Raghuveer et al., 2016; Goriounova & Mansvelder, 2012). Additionally, smoking imposes an economic burden on individuals as well as healthcare systems (Goodchild et al., 2018).

Studies indicate that adolescents in the United States who initiate substance use before the age of 15 face a higher risk approximately six and fifth times of developing substance use disorders compared to those who start at or after the age of 21 (Feinstein et al., 2012). The likelihood of developing a substance use disorder decreases by about four to five percent for each year that initiation is delayed between ages 13 and 21 (Jordan and Andersen, 2017). Specifically, individuals who begin using substances before they turn 15 are expected to struggle with substance abuse for longer a period compared to those who start later in life (Dennis et al., 2005). As such, adolescence is a critical period to intervene to prevent tobacco use dependence in later life.

Adolescence is a phase of growth and change in a person's development. Studies suggest that during adolescence there is a noticeable decrease in warmth, closeness, and shared time between parents and their children accompanied by an increase in conflicts (Shanahan et al., 2007; Shearer et al., 2005). Despite these changes in the parent-child relationship, the caregiver-child relationship is the most influential during adolescence, guiding pivotal decisions that are meaningful and important to the positive outcomes experienced by teens. As such, the importance of having a bond between caregivers and teens remains. Parents play a role in protecting and guiding the adaptation and growth of teenagers (Hall-Lande, 2007). The quality of the relationship between caregivers and adolescents has an impact on their overall well-being (Collins & Laursen 2004). Several studies have shown that having a higher quality of parent-child relationship, including aspects like secured attachment, supportiveness, and interaction contributes to the constructive development of teenagers (Julan et al., 2022; Imrie et al., 2021). On the other hand, a less-than-satisfactory relationship between parents and children has been associated with reduced well-being, compromised mental health, and the adoption of unhealthy behaviors among teenagers (Gong et al., 2022). A strong and positive connection between parents and their children is linked to a reduced risk of teenagers getting involved in substance use (Drapela & Mosher 2007; McBride et al., 2005).

Among the crucial family factors protecting teens from substance use, parent-child communication and parental monitoring have received great research attention. Quality parent-child communication such as open, and honest communication has been shown to prevent the initiation of tobacco use among adolescents (National Center on Addiction and Substance Abuse, 2011; Maggi et al., 2014; Metzger et al., 2013). The quality of communication between parents and children serves as a reflection of their relationship (Luk et al., 2010). Actively discussing the

dangers of tobacco smoking with children is identified as an efficacious strategy to discourage this behavior (Shin et al., 2020; Broun et al., 2021). Likewise, research well documents the protective role of parental monitoring in preventing teen tobacco use (Gordon et al., 2020; Rusby et al., 2018; Branstetter et al., 2009; Mills et al., 2021). Parental monitoring such as parent ability to know their child's physical whereabouts and parent's ability to gather information, establish rules, and enforce acceptable boundaries that influence their teenager's behavior has been shown to reduce all tobacco and alcohol use among adolescents, regardless of age and gender (Mills et al., 2021). Furthermore, a comprehensive literature review found some aspects of parental monitoring that include parental control and parent's ability to enforce acceptable boundaries or rules offer more protection against substance use than just parental knowledge about their child's activities (Ryan et al., 2015).

Although research has extensively documented the protective role that strong parent-child bonds, parent-child communication, and parental monitoring play in adolescent behavioral outcomes, prior research primarily focuses on how parent-child communication, parental monitoring, and caregiver-child relationship individually influence adolescent substance use. There is still much to understand about how these familial processes interplay with each other to influence adolescent behavior, especially regarding teen tobacco use. Moreover, prior studies have largely overlooked gender-specific influence, specifically the differences between father-child relationships and mother-child relationships when it comes to teen tobacco use (Stanton et al., 2009; Kong et al., 2012). Family communication and interaction between father-child versus mother-child dyads may function differently to influence teen tobacco use (Williams & Kelly, 2005). Addressing these research gaps is vital for prevention efforts and underscores the

importance of regulating smoking habits in teenagers to prevent immediate and long-term complications in teenagers and adults.

Statement of the Problem

Despite significant efforts aimed at reducing tobacco use, it remains a widespread problem among adolescents and stands as the primary cause of preventable deaths in the United States, accounting for approximately one out of every five fatalities (United State Department of Health and Human Services, 2014; Mokdad et al. 2023). Over 90% of adult who smoke start smoking before they turn 18 years old. This highlights why preventing tobacco use onset in adolescence is crucially important (Brian et al., 2023). The increasing rate of tobacco use among teenagers is a cause for concern, especially considering the changing landscape of tobacco products. According to Gentzke et al. (2019), there has been a 38% rise in tobacco use among high school students and a 29% increase among middle school students between 2017 and 2018. In February 2020, there were more than 2800 hospitalizations and 68 deaths reported across the United States with approximately 15% of the patients under the age of 18 as a result of tobacco-related products (CDC, 2023).

Given existing literature supports the protective effects of the parent-child relationship in preventing adolescent tobacco use, the parent-child relationship has long been an important target for prevention efforts on adolescents' tobacco use. Although research consistently shows that higher caregiver-child relationships, positive parent-child communication, and parental monitoring reduce the likelihood of tobacco use (DiClemente et al., 2001; Kerr & Stattin 2001; Wang et al., 2013), there are inconsistencies in empirical findings and gaps in our understanding of the intricate dynamics within caregiver-child relationships and how they affect teen tobacco

use. While some studies demonstrate connections between family factors and future substance use others find weak or insignificant associations. For example, Von Ah et al. (2005) discovered that emotional and social support from families did not significantly reduce cigarette smoking among students who attend school. Chassin et al. (2005) identified parental control, supportiveness, and expectations as poor predictors of cigarette smoking. These inconsistent findings may partly be attributed to the complex interplay between family relationships and teen tobacco use.

Another challenge in studying adolescent smoking is the transitional nature of adolescence and the associated changes in family dynamics (e.g., increased parent-child conflict) add to the complexity of understanding how different family factors interact to influence adolescents' developmental and behavioral outcomes (Darling & Cumsille, 2003). To gain a better understanding of how family relationships impact teenage smoking to inform the development of effective parent-child interventions, further research is needed to clarify the critical family processes, for example, parent-child communication and parental monitoring, at play, with attention particularly given to gender-specific factors. Previous research has primarily focused on mother-child relationships while neglecting variations in father-child dynamics (Branstetter et al., 2009). Yet research shows a strong correlation between fathers' attitudes and behavior toward drug use and their children's attitudes and behaviors concerning drug use (Williams & Kelly, 2005). This suggests a need for further research aimed at unraveling these specific gender differences, specifically, how mother-child and father-child communication dyads influence adolescent substance use differently.

Lastly, many existing studies employ a small sample size and primarily focus on multiple substance use (Hiemstra et al., 2017; CDC, 2014). There is a critical need to use large-scale,

nationally representative data to unravel the critical family relationships and dynamics underlying teen tobacco use. As such, this representative sample ensures increased generalizability of the findings, making it applicable to a wider population and strengthening the reliability of the conclusion drawn for the study.

To bridge the existing gap, I investigated the relationship between the caregiver-child relationship and teen tobacco use, and the mediating roles of parental monitoring and parent-child communication, with a focus on potential gender-specific differences in father-child and mother-child. Specifically, I examined how communication and relationships occurring between mother-child dyads versus father-child dyads operate differently to influence teen tobacco use. By considering the nature of complex family interactions and incorporating gender-specific dynamics, this study offered a more holistic understanding of the complex relationships that influence teenage tobacco use. This study also advanced prior studies methodologically. The data used for this study was derived from a large-scale nationally representative dataset, the Future of Families and Child Wellbeing Study (FFCWS; Reichman, et al., 2001). The FFCWS utilizes multi-assessment and multi-informant methods to assess family relationships. The features of FFCWS helped corroborate and strengthen findings from prior studies that are limited by small sample sizes. This study was guided by the following questions.

Research Questions:

1. How does the quality of caregiver-child relationships influence teen tobacco use among adolescents?
2. What is the role of parental monitoring in mediating the relationship between caregiver-child relationship and teen tobacco use?

3. How does parent-child communication (father-child and mother-child) mediate the relationship between caregiver-child relationship and teen tobacco use?
4. Is there gender-specific differences in the impact of father-child communication and mother-child communication on teen tobacco use?

Definitions of Terms

Primary caregiver- The primary caregivers in this study encompass both biological mothers and fathers, other non-parental caregivers such as stepmothers, grandmothers, and stepfathers, uncles, friends, and grandfathers if they have lived with the teen half or more than half the time, indicating those with whom the teen predominantly spend most of their daily time with.

Parental monitoring- This involves parental knowledge about a child's physical whereabouts, for example, whom the child spent their time with, whether it is at school or during extracurricular activities; it reflects a parent's ability to gather information, establish rules, enforce acceptable boundaries that influence their teenager's behavior (Stattin & Kerr, 2000; Tharp & Noonan, 2012)

Caregiver-child relationship quality- This involves the extent to which teen feels close to their primary caregivers.

Parental communication- This is perceived as the exchange of information between caregivers and teens. It includes the extent to which caregivers share and exchange information and ideas with teens either on the phone or in person (Gazendam-Donofrio et al., 2009)

Tobacco- This involves the frequency of smoking in the past 30 days.

CHAPTER II

REVIEW OF LITERATURE

Family systems theory was used to guide the conceptualization of the association between the quality of caregiver-child relationships and teen tobacco use, with parent-child communication and parental monitoring as the mediators. Figure 1 - 3 presents the hypothesized model for this study. Firstly, I discussed family systems theory. Informed by family systems theory, I discussed the importance of the caregiver-child relationship and how it relates to teen tobacco use through the effect of parental monitoring and parent communication. I further discussed the gender-specific difference (e.g., father-child dyad and mother-child dyad) in parent-child communication and its influence on teen substance use.

Family Systems Theory

Family systems theory provides a valuable framework for comprehending the dynamics of caregiver-child relationships and their impact on various aspects of adolescent development, especially behaviors such as teen tobacco use. Family systems theory places significant emphasis on communication within the family unit, considering it a fundamental element of family functioning (Yerby, 1995). According to family systems theory, family members constantly communicate, shaping the family's overall dynamics (Broderick, 1993). The quality and nature of parent-child communication serve as a critical interpersonal construct that mirrors the parent-child relationship, with implications for adolescents' engagement in risky behaviors like tobacco use (Metzger et al., 2013).

Research has consistently shown that a strong quality of parent-child relationships significantly impacts adolescent development across diverse family structures (Buchanan et al., 2000; Gray & Steinberg, 1999; Steinberg, 2001). The reciprocal relationship between parent-

adolescent relationship and adolescent behavior aligns with the concept that high-quality parent-child bonds protect adolescents from internalizing and externalizing problems (Steinberg, 2001). Additionally, a strong parent-child relationship can provide the foundation for effective monitoring involving caregivers being attentive to their child's actions and behaviors through surveillance (Kerr & Stattin, 2000). Caregivers with a positive relationship with their children are more inclined to engage in their child's life, effectively monitoring their activities and behaviors.

According to family systems theory, a family is more than a combination of people related to each other; it has a holistic quality. Individual parts are interconnected, and individual members can be understood only within the context of the whole (Broderick, 1993). Within this study, the whole possesses its communication pattern, rules about curfew, and how late teens can stay late at night. Thus, it is crucial to understand teenagers within these familial relationships, especially the relationship quality with their caregivers. The caregiver-child relationship impacts both monitoring and communication.

Moreover, it is essential to recognize that how parents and teenagers communicate is closely tied to the quality of their relationship. The bond between a caregiver and a child sets the stage for how teenagers perceive and participate in conversations with their parents. When there is a connection between caregivers and children, it fosters open communication between parents and teenagers (APA, 2023). Consequently, this strengthens parental monitoring. For example, a parent's ability to gather information and know their child's whereabouts, establish rules, and enforce acceptable boundaries will influence their teenager's behavior (Stattin & Kerr, 2000; Tharp & Noonan, 2012).

These factors, in turn, may affect each other and be interrelated. A high-quality relationship between caregivers and children improves effective parental monitoring and communication. The interrelated relationship between parental communication, parental monitoring, and the caregiver-child relationship creates an essential link between parents and teenagers, potentially protecting adolescents against tobacco use (Lander et al., 2013). The effectiveness of parent-child communication depends in part on the frequency and content of the communications (Ennett et al., 2001) and can serve as a decisive protective factor in preventing teen tobacco use (National Center on Addiction and Substance Abuse, 2011).

Family systems theorists consider how mothers, fathers, and all teens interact together to shape the behaviors of individual members and how individual members contribute to family life overall (King et al., 2021). Therefore, this research employs family systems theory to offer a framework for understanding the interaction between caregiver-child relationships, parental monitoring, communication patterns, and teen behavior like tobacco consumption. It highlights the significance of viewing the family as a unit and how it impacts each member, making it particularly important to explore tobacco use within the context of caregiver-child dynamics.

Caregiver-Teen Relationship and Teen Tobacco Use

Adolescence is a critical phase where relationships play a pivotal role in shaping development, including behaviors like tobacco use (National Scientific Council on the Developing Child, 2004). Studies suggest that during adolescence there is a decrease in warmth and closeness and increased conflict between caregivers and their children (Shanahan et al., 2007; Shearer et al., 2005). Despite this conflict, the caregiver-child relationship is the most influential during adolescence, guiding pivotal decisions that are meaningful and important to the

positive outcomes experienced by teens (O'Conner, 2002; Lerner & Laurence, 2004). While these relationships are expected to evolve during this period, individual differences in perceived relationship quality tend to persist (Allen & Manning, 2007). The bond between a caregiver and a child, often known as the parent-child relationship, is an ever-changing connection. It involves the caregiver, a parent, or guardian and plays a significant role in the child's emotional, cognitive, and social growth (Chang et al., 2017). This relationship encompasses interactions, emotions, and experiences that shape the child's well-being and influence their relationships (Suldo & Fefer, 2015; Wang et al., 2017; Chang et al., 2017).

Moreover, the quality of the parent-child relationship significantly impacts adolescent mental health (Yulia et al., 2021). Collins and Laursen (2004) affirm that a high-quality parent-adolescent relationship such as a strong emotional bond fosters positive and healthy development (Xie et al., 2022). Conversely, low-quality relationships (e.g., parental harshness, emotional distance, lack of communication, and neglect) have been linked to adverse outcomes, including diminished quality of life such as delinquency, depression, and tobacco use (Wen & Lie, 2012; Wang et al., 2017; Wilson et al., 2024). For example, longitudinal studies underscore the significance of the caregiver-child relationship in adolescent development. Hadiwijaya and Colleagues (2017) observed that turbulent relationships with parents, marked by low support, increased from 14% in early adolescence to 29% in middle adolescence.

In contrast, a study involving families with transgender parents and their children found that high-quality parent-child relationships, for example, express warmth, affection, and quality interaction, were associated with positive psychological adjustment (Zadeh et al., 2020). These findings align with other population-based studies that examine how parent-child relationship quality, parental substance use, and psychological well-being are associated with reduced alcohol

and marijuana use among adolescents who are between the ages of 13 – 14 years (Church et al., 2014; Veldorale-Griffin, 2014).

In addition, King's and Amato's (2018) research revealed that adolescents who had close relationships with their resident parents (parents whom adolescents live with most of the time) reported lower levels of substance use, including smoking cigarettes. This trend persisted into early adulthood, emphasizing the enduring impact of positive caregiver-child relationships. Moreover, studies highlight that high-quality caregiver-child relationships, characterized by maternal warmth, parental emotional support, positive interactions, and father involvement, are linked to positive developmental outcomes such as academic success and empathy for adolescents (Stright & Yeo, 2014; Perry et al., 2020; Rothenberg et al., 2019; Pleck, 2007). Even in the context of adolescents who have a history of maltreatment, positive caregiver-child relationships act as a significant protective factor, mitigating the adverse effects of maltreatment and promoting resilience (Afifi & MacMillan, 2011).

Specifically, regarding tobacco use, research consistently shows that close, high-quality caregiver-child relationships and positive parenting are associated with reduced likelihood of adolescents engaging in tobacco use (Guibord et al., 2011; Yoon, Maguire-Jack, et al., 2020; Meng et al., 2018; Davidson-Arad & Navaro-Bitton, 2015). This is supported in the study conducted by Johnson (2011) in which a survey administered by the Community that Cares was utilized to evaluate the quality of caregiver-child relationships. This research encompassed 570 students, primarily within the age range of 12 to 19, with the majority concentrated in the 13-14 age group and enrolled in grades 7 to 9 at Northwest Elementary and High Schools. The study's findings indicated a significant link between a stronger caregiver-child relationship. They reduced adolescent substance use, particularly concerning tobacco use, when adolescents

engaged in enjoyable activities with their parents. These findings underscore the direct impact of caregiver-child relationships on teen tobacco use.

The extensive literature reviewed here provides compelling evidence for the direct relationship between caregiver-child relationships and teen tobacco use. High-quality caregiver-child relationships, characterized by closeness, support, and positive interactions, act as powerful protective factors against teen engagement in tobacco use. Hence, in this study, I hypothesize that a greater caregiver-child relationship will be associated with reduced teen tobacco use.

Parental Monitoring and Parent-Child Communication as Mediators

In addition to the direct association between the caregiver-child relationship and teen tobacco use, the caregiver-child relationship is also likely to influence teen tobacco use indirectly through the effects of parental monitoring and parent-child communication. The bond between a caregiver and a child sets the stage for how teenagers perceive and participate in conversations with their parents. When there is a connection between caregivers and children, it fosters open communication between parents and teenagers (The Partnership, 2023; CDC, 2023). The caregiver-child relationship is also crucial to managing adolescents since adolescents look to a significant adult for support and control. As such, a positive caregiver-child relationship facilitates parental monitoring (Achard et al., 2006). Improved parent-child communication and parental monitoring will, in turn, protect teens from elevated tobacco use.

Parent Monitoring as A Mediator

Parental monitoring is a critical protective factor in addressing substance use, particularly tobacco among teenagers. The concept of monitoring includes parents' awareness of their child's activities, which involves keeping track of and observing them (Kerr & Stattin, 2000; Branstetter et al., 2009). Parental monitoring has consistently proven to be a significant tool for reducing

substance use, including tobacco (LaParo et al., 2020; Gordon et al., 2020; Rusby et al., 2018; Branstetter et al., 2009; Abar et al., 2017; Mills et al., 2021). Parental monitoring goes beyond being aware of teens physical locations, for example, whom the child spends their time with, whether it is at school or during extracurricular activities; it reflects a parent's ability to gather information, establish rules, enforce acceptable boundaries that influence their teenager's behavior (Stattin & Kerr, 2000; Tharp & Noonan, 2012).

Parental monitoring has been established as one of the predictors of teenage substance use (Lac & Crano, 2009; Griffin et al., 2000). Numerous studies have revealed that it reduces substance use, including tobacco consumption (Gordon et al., 2020; Rusby et al., 2018; Branstetter et al., 2009; Mills et al., 2021). Mills et al. (2021) used self-reported data from 16 middle and high school students (N=2351) in West Virginia to examine parental monitoring and substance use. Findings indicated that parental monitoring was significantly and negatively related to all tobacco and alcohol use regardless of age and gender and concluded that parental monitoring was protective against substance use for all participants. Conversely, when there is a lack of monitoring, there is an increased risk of adolescents engaging in alcohol use (Rusby et al., 2018; Muchiri & dos Santos, 2018).

The association between parental monitoring and substance use has also been well supported by longitudinal data. In a two-year longitudinal study, Branstetter et al. (2009) found that maternal monitoring was associated with reducing substance use and mediates the link between a more secure attachment style and substance use. Recently, Booth and Shaw (2022) analyzed a five-wave (10-17) longitudinal dataset collected as part of the Pitt Mother and Child Project (N=228). The study found that parental monitoring at age 12, as opposed to age 15, was linked to involvement with antisocial peers at 15 and substance use at 17. This finding suggest

that parental monitoring might exert the most influence during teenage years. This further integrates how important it is for parents to actively monitor their children's behavior as a measure against forms of substance use and emphasizes the importance of early and consistent monitoring practice to establish a foundation for positive teen development. Hence, there is a need to examine the complex interplay between the caregiver-child relationship and teen tobacco use through the effect of parental monitoring. In this study, I hypothesized that parental monitoring mediates the association between the caregiver-child relationship (father-child and mother-child) and teen tobacco use.

Mother-child and Father-child Communication as a Mediator

Communication between caregivers and their children is critical in shaping teenagers' tobacco usage. improved parent-child communication has been linked to rates of tobacco use among teenagers (Eisenberg et al., 2019). Recent studies have found that parent-child communication is negatively related to adolescents' substance use (P-wang et al., 2022; Miller-day et al., 2008; Eisenberg et al., 2019; Ebersole et al., 2014; Huansuriya et al., 2014; Achard et al., 2006). Conversely, poor parent-child communication has positively affected adolescents' substance use (Luk et al., 2010).

Mothers and fathers often have different communication styles (Rosnati et al., 2007). Moreover, research suggests a correlation between fathers' attitudes and behavior toward drug use and their children's attitudes and behaviors concerning drug use (Williams & Kelly, 2005). In contrast to fathers' communication patterns, mothers generally engage in conversations with their children covering a broader spectrum of topics than fathers (Miller-day et al., 2002). However, it is worth emphasizing that there could be variations in the father-child communication dyads, mother-child communication dyads, and teen tobacco use. For instance, Miller-day et al. (2002)

distributed a health behavior survey originally designed for school-age children survey (N= 1308) to tenth graders. The study found that father-child communication was associated with a reduction in marijuana use, while mother-child communication was associated with a reduction in smoking behavior. In light of the different influences of fathers versus mothers' communication with their children, I examine how father-child communication and mother-child communication are associated with teen tobacco use separately.

In summary, I hypothesize that parent-child communication (father-child and mother-child dyads) mediates the association between caregiver-child relationships (father-child and mother-child dyads) and teen tobacco use. Further, I examined how mother-child and father-child communication differs in its effect on teen tobacco use.

Risk Factors Associated with Teen Tobacco Use

Caregiver substance use has been identified as a critical risk factor for teen tobacco use. I will discuss how caregiver substance use may interfere with family relationships to influence teen tobacco use.

Caregiver Substance Use

Teenagers are often influenced by caregivers who smoke when engaging in tobacco-related behaviors (Jackson & Henrikson, 1997; Laniado Laborín et al., 2002; Moreno et al., 1994). It has been observed that households with smoking caregivers usually exhibit prompting behaviors that lead to tobacco use among adolescents. Up to 68% of teenagers in households have reported experiencing at least one prompting behavior (Laniado Laborín et al., 2004). Studies have also indicated that adolescents exposed to their parent's substance use disorder risk developing substance use disorders themselves (Hussong et al., 2008; Ijadi-Maghsoodi et al.,2014).

Parental substance abuse may discourage parents from seeking help, leading to adverse outcomes such as nicotine dependence for teenagers (Sznajder et al., 2011). Furthermore, being exposed to secondhand smoke has health implications for teenagers. Caregivers and other family members who smoke significantly raise the likelihood of tobacco use and intentions to use in Black households and other communities (Kandel et al., 2015; Wellman et al., 2016). A comprehensive analysis found that when one parent smoked, the risks of smoking increased by 67%. The risk was even higher when it was the mother than the father, who smoked (Leonardi Bee et al., 2011).

To summarize, caregivers play a role in shaping adolescents' behaviors, including risky choices. This influence is exerted through their parenting practices (Kandel et al., 2015; Leonardi Bee et al., 2011; Wellman et al., 2016). These findings highlight the importance of addressing caregiver substance use to mitigate the associated risks of tobacco use. Furthermore, caregiver substance use is a model for imitation among adolescents and might impact their substance use through impaired parenting. This intricate relationship emphasizes the need for prevention strategies considering caregiver substance use and parenting practices.

Research Questions and Hypotheses

Informed by family systems theory (Broderick, 1993) and existing literature on parent-child relationships and family dynamics, as illustrated in Figure 1, I will examine the following research questions and hypotheses.

Research question 1: How does the quality of caregiver-child relationships influence teen tobacco use among adolescents?

Hypothesis 1: A greater caregiver-child relationship will be associated with reduced teen tobacco use.

Research question 2: What is the role of parental monitoring in mediating the relationship between caregiver-child relationship and teen tobacco use?

Hypothesis 2: Parental monitoring will mediate the association between caregiver-child relationship and teen tobacco use.

Research question 3a: How does father-child communication mediate the relationship between father-child relationship and teen tobacco use?

Research question 3b: How does mother-child communication mediate the relationship between mother-child relationship and teen tobacco use?

Hypothesis 3a: Father-child communication will mediate the association between father-child relationships and teen tobacco use.

Hypothesis 3b: Mother-child communication will mediate the association between mother-child relationship and teen tobacco use.

Research question 4: Are there gender-specific differences in the effects of father-child communication and mother-child communication on teen tobacco use?

Hypothesis 4: The impact of mother-child communication on reducing teen tobacco use will differ significantly from the impact of father-child communication on reducing teen tobacco use.

CHAPTER III

METHODOLOGY

Participants

This study utilized data from the Future of Family and Child Wellbeing Study (FFCWS), a longitudinal cohort study that followed 4,898 families from the birth of the focal child from 1998 to 2000, and conducted interviews when the child was 1 (1999 – 2001), 3 (2001 – 2008), 5 (2003 – 2006), 9 (2007 – 2010), and 15 (2014 – 2017) years old. The study used stratified random sampling to obtain participants from 20 US cities with a population of at least 200,000 individuals.

For this study, I use teen survey data from the Year 15 follow-up, which occurred between 2014 and 2017. In the baseline, all 4,898 families participated in the study. However, for our analyses, we drew on data from the 15th-year follow-up (2014-2017), with a detailed analytical sample of 3,444 adolescents (70% of the total sample) who completed the teen survey. By age 13, according to a report compiled by the National Institute of Drug Abuse and the United States of America (2014), 25% of teenagers report engaging in cigarette smoking while more than 70 % have initiated alcohol. Substance use during this age period is harmful and has long-lasting negative effects (Mellissa et al., 2020). The sample was racially and ethnically diverse, including 46.5% Black, 23.61% Hispanic, 17.13% White, others 2.5%, and 5.08% multi-racial participants.

The data from the Future of Families and Child Wellbeing Study includes oversampled children to unmarried mothers by a ratio of 3 – 1 (Reichman et al., 2001) and focuses on how non-marital childbearing impacts child developmental outcome from families experiencing socio-economic disadvantages and parental relationship instabilities, an important population and

provides a unique opportunity to examine the relationship between caregiver-child relationship and teen tobacco use since they are more likely to experience negative outcomes such as poverty and poor health (Reichman et al., 2001).

Teen Tobacco Use

The survey question concerning teenage substance use in this study were drawn from three research studies: the National Survey on Drug Use and Health (NSDUH) conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA) (2010), the National Longitudinal Study of Adolescent Health (Add Health) led by Harris and colleagues (2009), and the Monitoring the Future surveys conducted by Johnston and colleagues (2009). These studies were specifically designed to investigate substance use and thus offer a more comprehensive level of detail on these subjects compared to what was originally available in the Future Family and Child Wellbeing Study (FFCWS).

Regarding tobacco use, the survey inquired whether teenagers had ever smoked a complete cigarette. If they responded affirmatively, the survey went on to explore the frequency of smoking in the last month. Teenagers reported the frequency of tobacco use in the past month, responses were rated on a 4-point scale ranging from *(1 = never, 2 = once or twice a week, 3=3–5 days a week, 4 = 6–7 days a week)*.

This item has been used in another study assessing adolescents' substance use and depression (Pei et al., 2020) and has a predictive validity in prior national longitudinal studies with racial and ethnic minority adolescents (Mellissa et al., 2020). In the current study, the frequency of tobacco use was averaged, with higher scores indicating a higher level of tobacco use. The Cronbach alpha was 0.91.

Parental Monitoring

Teenagers were asked three questions assessing parental monitoring. These questions were adapted from two primary sources: the National Longitudinal Survey of Youth 1997 (NLSY97) and the Youth Self-Administered Questionnaire (YSAQ) by the Fragile Family and Child Wellbeing Study (FFCWS)

The survey posed questions to teenagers regarding the individuals responsible for establishing rules or limitations in three specific domains: (1) curfew, (2) media consumption (such as TV shows and movies), and (3) social interactions (including who they are allowed to spend time with). Each question presented three response options for the teenagers to choose from (a) parents set the limits, (b) the child decides for themselves, or (c) parents and the child jointly decide. Specific questions include, 1) Who decides how late the teen stays out at night? 2) who decides what kinds of TV shows and movies the teen watches? and 3) Who decides whom the teen can hang out with? The items were coded as 3 = *the parent and teen jointly decide*, 2 = *teen decide*, or 1 = *the parent decide*.

The reliability of the NLSY97 AND YSAQ with high-risk adolescents has been supported by previous research (Gajos et al., 2022). In the present study, the items were averaged so that higher scores correspond to greater parental monitoring with a Cronbach alpha of 0.99.

The questions used in the Future Family and Child Wellbeing Study (FFCWS) closely resembled those found in the NLSY97 and YSAQ, with minor modifications in the wording and tense of the questions. The FFCWS questions included the word "can" to highlight the sense of capability or permission. In contrast, the YSAQ questions referred to past actions and asked about who had set the limits in retrospect. However, the FFCWS questions were framed in the present tense, focusing on the current situation.

Caregiver-Child Relationship

The survey items utilized to evaluate the caregiver-child relationships were derived from two sections of the National Survey of Children's Health: The Family Functioning section and the Middle Childhood and Adolescent section (National Survey of Children's Health, 2003). These items aimed to assess the level of closeness between the parent/caregiver (PCG) and the teen. Like the original survey (Reichman et al., 2001), the extent of closeness between the biological father and mother and the teenager was measured using a Likert scale that ranged from 4 (*extremely close*) to 1 (*not very close*).

By adopting these items, the study sought to examine the quality of the caregiver-child relationship in terms of emotional proximity. The Likert scale provided a structured framework to capture the nuances and variations in the perceived closeness between the PCG and the teenager, enabling a quantitative assessment of this aspect of the relationship. The item ratings were averaged with higher scores indicating higher quality of caregiver-child relationships. The internal reliability for this scale was 0.91.

Father-child and Mother-child Communication

Teenagers were asked one question on mother-child communication and father-child communication. This item has been used in another population study (Yoon et al., 2017) and among Latino adolescents (Guilamo-Ramos et al., 2008). However, the item didn’t measure mother-child and father-child communication specific to tobacco use but instead measured general mother-child and father-child communication. The questions’’ how well do you and your biological father talk and share ideas? and how well do you and your mom talk and share ideas using a 4-point Likert scale, ranging *from 4, (extremely well) to 1, (not very well),* to assess the extent of communication.

By utilizing Likert scales and addressing communication with these parental figures, the survey aimed to capture the nuances of communication patterns within the family. This approach allowed for an assessment of the quality and effectiveness of communication between the teenager and their mother, and the teenager and their father (Reichman et al., 2001). In the present study, items on the extent of communication between father-child and mother-child dyads were rated and averaged, with a higher score indicating higher father-child and mother-child communication. The Cronbach's alpha was good (0.86)

Covariates

To account for potential confounding factor, primary caregivers' tobacco use was taken into consideration in the model. The tobacco use of the primary caregivers was assessed. The survey included a question regarding whether the primary caregivers had ever smoked regularly. If they had, the following information was collected: The frequency of smoking in the past 30 days, responses were rated on a 4-point scale ranging from *1 (never), 2 (once or twice a week), 3 (3–5 days a week), and 4 (6–7 days a week),* this item on the frequency of smoking were rated and averaged, with a higher score indicating higher tobacco use. Cronbach's alpha was good (0.78).

These variables related to the primary caregiver's tobacco use were included as covariates in the model because adolescents who are exposed to parental substance use are at a higher risk of developing substance use disorders (Ijadi-Maghsoodi et al., 2014). Other studies have found parental substance use to be a strong predictor of subsequent substance use issues indicating a causal relationship and the need to modify parenting practices to avoid negative outcomes in teenagers (Hussong et al., 2008; Stein et al., 2002; Ijadi-Maghsoodi et al., 2014). Hence, this present study included this covariate in the analysis; the study aims to account for the potential

effects of primary caregiver's tobacco use on teen tobacco use. This approach helps to ensure that any observed relationships between caregiver-child relationship and teen tobacco use can be accurately attributed to the variables of interest while controlling for parental tobacco use.

Analytical Plan

Research question 1: The data was first analyzed using descriptive statistics (mean, standard deviation, and range). Bivariate correlation was used to explore the relationship between caregiver-child relationship, parental monitoring, parent-child communication, and teen tobacco use. Structural Equation Modeling (SEM) was used to assess the association between the caregiver-child relationship and teen tobacco use while controlling for parental tobacco use.

Research question 2: The hypothesized model was tested using R software to examine the direct path from quality of caregiver-child relationships to teen tobacco use and the indirect path through parental monitoring. Similarly, for Research Question 3, R software was also used to examine the direct paths from caregiver-child relationship to teen tobacco use and the indirect path through parent-child communication (father-child and mother-child dyad). Bootstrap analysis with 1000 bootstrap samples was generated to estimate the confidence intervals and standard errors of the mediating effect.

Research question 4: Structural Equation Modelling (SEM) was used to assess whether the structural paths from father-child communication and mother-child communication differ in its impact on teen tobacco use.

Table 1.

Demographic Characteristics of the Current Sample (N= 3444)

Variables	n (%)
Gender	
Male	1760 (51.6)
Female	1684 (48.4)
Ethnicity	
White-only, non-Hispanic	590 (17.13)
Black/African America	1601 (46.5)
Hispanic/Latino	813 (23.61)
Others only, non-Hispanic	86 (2.5)
Multi-racial	175 (5.08)
Primary Caregiver Level of Education	
Less than high school	628 (12.8)
High school or equivalent	700 (14.3)
College	1556 (31.8)
Graduate	669 (13.7)

Note. Year 15 data were collected in 20 U.S. cities in 2018.

CHAPTER IV

RESULTS

Results of the descriptive, bivariate correlation and the mediating effects of caregiver-child relationship, parental monitoring, and parental communication (father-child communication and mother-child communication) to each hypothesis are presented in this chapter. All analyses were conducted with R software 4.3 (R. Development Core Team, 2023). The R syntaxes can be found in Appendix B. Moreover, there is a corresponding table for each analysis indicating statistically significant results.

Correlations of the Study Variables

Table 2 reports the descriptive statistics and the zero-order correlations of all study variables and the p-value for these statistics. Caregiver-child relationships, parental-child communication, and parental monitoring showed a significant negative correlation with teen tobacco use. This suggests that a higher quality of the caregiver-child relationship, effective parental communication, and increased parental monitoring are associated with reduced teen tobacco use. Caregiver-child relationships were significantly correlated with both parent-child communication and parental monitoring in a positive direction. This suggests that a better caregiver-child relationship is associated with greater communication and increased parental monitoring.

Table 2.

Means, Standard Deviations, and Zero-Order Correlations Among Research Variables

	Variables	1	2	3	4	5	6	7
1	Teen Tobacco	___						
2	Mother-child relationship	-.11**	____					
3	Father-child relationship	-.07**	.14**	_____				
4	Mother-child communication	-.07**	.59**	.12**	___			
5	Father-child communication	-.06**	.13**	.72**	.16**	___		
6	Parental monitoring	-.07**	.23**	.08**	.24**	.13**	-.01	___
M		.08	3.36	3.05	2.63	2.67	2.46	0.61
SD		.39	.87	.89	1.18	1.10	0.37	1.15
Minimum		.00	1.00	1.00	1.00	1.00	1.00	0
Maximum		4.00	4.00	4.00	4.00	4.00	3.00	3

** $p < .01$.

Hypothesis 1: A greater caregiver-child relationship will be associated with reduced teen tobacco use.

Table 3 shows the result of the Structural Equation Modeling (SEM) used to investigate the relationship quality between the caregiver-child relationship and teen tobacco use. After controlling for parental tobacco use. The result showed that the caregiver-child relationship showed a significant negative relationship with teen tobacco use ($b = -.05$, $p < .001$). This negative association indicates that a greater caregiver-child relationship may contribute to lower levels of tobacco use among teens. This suggests that as the quality of caregiver-child relationships improves, the use of tobacco among teens decreases. Next, a covariate was added, i.e., parental tobacco use, as shown in Table 3 the result showed a positive coefficient for parental tobacco use ($b = 0.03$, $p < .001$), indicating that there is a direct relationship between parent tobacco use and teen tobacco use. This suggests that teens are likely to use tobacco if their parents engage in tobacco use. Parental tobacco use is a significant predictor of teen tobacco use. This suggests that parental behavior is a critical factor in teen tobacco use.

In summary, the findings of this study emphasized the significant role that the caregiver-child relationship plays in influencing teen tobacco use. While the quality of caregiver-child relationships increases teen tobacco use decreased. Therefore, hypothesis one was supported.

Table. 3.

The Direct Effect of the Caregiver-child Relationship on Teen Tobacco Use (N = 3394)

DV = Teen tobacco use			
Variables	b	SE	P-value
Caregiver-child relationship	-.05***	0.01	.000
Covariate			
Parental tobacco use	.03***	0.01	.000

Notes. *p <.05; ** p <.01; *** p <.001.

Hypothesis 2: Parental monitoring will mediate the association between caregiver-child relationship and teen tobacco use.

Table 4 shows the result of the mediating effect of parental monitoring in the relationships between caregiver-child relationship and teen tobacco use. After controlling for parental tobacco use, the direct effect of the caregiver-child relationship on teen tobacco use was (b = -0.05, p<.001) (see Figure 1). The total effect of the caregiver-child relationship was (b = -0.05, p<.001) while the effect of the caregiver-child relationship on parental monitoring was (b = 0.08, p<.001) and the effect of parental monitoring on teen tobacco use was (-0.05, p<.05) significant, suggesting that parental monitoring is a strong predictor of teen tobacco use. In analyzing the indirect effect of the caregiver-child relationship on teen tobacco use through parental monitoring, the procedure used to arrive at the mediation results is bootstrapping techniques recommended by Hayes, (2013). The indirect effect was (b=-.004, SE = .002, 95% CI [-.01, -.001] statistically significant.

In summary, the total effect of the caregiver-child relationship on teen tobacco use, including both the direct and indirect paths through parental monitoring, is statistically

significant. Specifically, parental monitoring significantly mediated the association between the caregiver-child relationship and teen tobacco use (b=-.00, p<.001).

This suggests that enhancing the caregiver-child relationship and parental monitoring could be effective strategies for reducing teen tobacco use. Therefore, the hypothesis that parental monitoring will mediate the relationship between caregiver-child relationship and teen tobacco use was supported by the results of the study.

Table 4

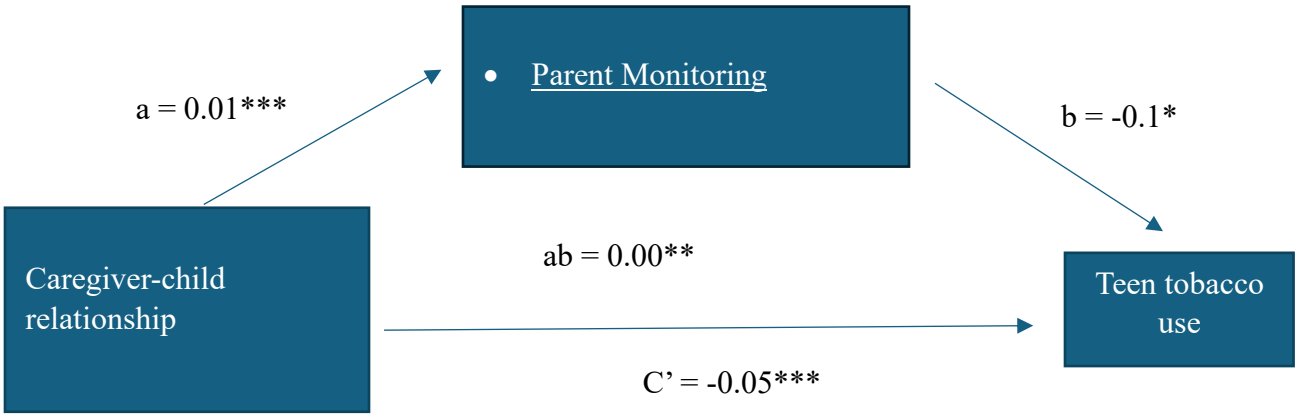
Mediating Model 1. The Effect of Parental Monitoring on the Relationship Between Caregiver-Child Relationship and Teen Tobacco Use (N=3394)

Description (coefficient label)	**b**	**SE**	**P-value**	**CI**
The direct effect of the caregiver-child relationship on teen tobacco use	-.05***	.01	.000	-.07; - .03
Indirect effect mother (mediation model)	-.00***	.00	.006	-.01; -00
Effect of caregiver-child relationship on parental monitoring	-.08***	.01	.000	-.07; -.10
Effect of parental monitoring on teen tobacco use	-.05*	.02	.022	-.00; -.01
Total effect of the caregiver-child relationship on teen tobacco use	-.05***	.00	.006	-.07; - .03

Notes. *p <.05; ** p <.01; *** p <.001; Std. Err of indirect effect was calculated using bootstrap. Unstandardized coefficients are shown in the table.

Figure 1.

The hypothesized model for the mediating effect of parental monitoring.



Hypothesis 3a: Father-child communication will mediate the association between caregiver-child relationship and teen tobacco use.

Table 5 reports the mediation effect of father-child communication on the relationship between father-child relationship and teen tobacco use. A structural equation model was used to test the hypothesized model (figure 2). As this model comprehended all possible links, it was a saturated model with the perfect fit measure (i.e., zero degrees of freedom). The result showed that this model accounted for 82.1% of the variance in father-child communication and 17.90% of the variance in teen tobacco use. As shown in (figure 1) the effect of the father-child relationship on father-child communication (b = .72, p<.001) was statistically significant. This suggests that for every one-unit increase in the father-child relationship, the father-child communication is expected to increase by .72 units. This implies that as the quality of the father-child relationship increases, so does the level of father-child communication increases. The effect of father-child communication on teen tobacco use was not statistically significant (b = -.01, p>.001). The direct effect of the father-child relationship on teen tobacco use through father-child communication was not statistically significant (b = -.02, p>.001).

In summary, even though a greater father-child relationship is associated with effective father-child communication, the father-child relationship did not impact teen tobacco use through father-child communication. Thus, the hypothesized mediational pathway was not significant (figure 2). That is, father-child communication did not mediate the relationship between father-child relationship and teen tobacco use. Therefore, the hypothesis is not supported by the data in the study.

Table 5

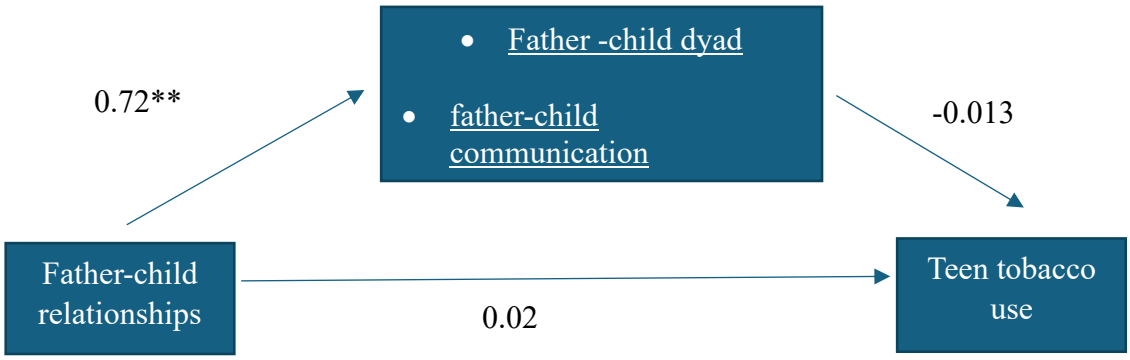
Mediation Model 2. The Mediating Effect of Father-Child Communication on the Relationship Between Caregiver-Child Relationship and Teen Tobacco Use (N = 2556)

Description (coefficient label)	**b**	**SE**	**P-value**	**CI**
The direct effect of the father-child relationship on teen tobacco use.	-.02	.01	.090	-.03; .00
Indirect effect (mediation model)	-.01	.01	.002	-.02; .01
Effect of father-child relationship on father-child communication.	.72***	.01	.000	.70; .75
Effect of father-child communication on teen tobacco use.	-.01	.01	.36	-.03; -.01
Total effect of the mother-child relationship on teen tobacco use	-.02*	.01	.002	-.04; - .01

Notes. *p <.05; ** p <.01; *** p <.001; Std. Err of indirect effect was calculated using Bootstrap Unstandardized coefficients are shown in the table.

Figure 2.

The hypothesized model for the father-child dyad.



Hypothesis 3b: Mother-child communication will mediate the association between caregiver-child relationship and teen tobacco use.

Table 6 reports the mediation effect of mother-child communication on the relationship between mother-child relationship and teen tobacco use. A structural equation model was used to test the hypothesized model (figure 3). As this model comprehended all possible links, it was a saturated model with the perfect fit measure (i.e., zero degrees of freedom). The result showed that this model accounted for 77.43% of the variance in mother-child communication and 22.57% of the variance in teen tobacco use. As shown in (figure 3) the effect of the mother-child relationship on mother-child communication was ($b = .63$, $p<.001$) statistically significant. This suggests that for every one-unit increase in the mother-child relationship, the mother-child communication is expected to increase by .63 units. This suggests that as the quality of the mother-child relationship increases, so does the level of mother-child communication increases. The direct effect of the mother-child relationship on teen tobacco use was ($b = -.05$, $p<.001$) negative and statistically significant. This suggests that for every one-unit increase in mother-child relationship teen tobacco use decreased by .05 units. The effect of mother-child

communication on teen tobacco use was (b = -.001, p>.001) was not statistically significant. The indirect association pathway of the mother-child relationship, mother-child communication, and teen tobacco use was not significant.

In summary, despite the direct negatively significant relationship between mother-child relationship and teen tobacco use, mother-child relationship did not influence teen tobacco use through mother-child communication. Thus, mother-child communication did not mediate the relationship between mother-child relationship and teen tobacco use (figure 3). Therefore, the hypothesis is not supported by the data in the study.

Table 6

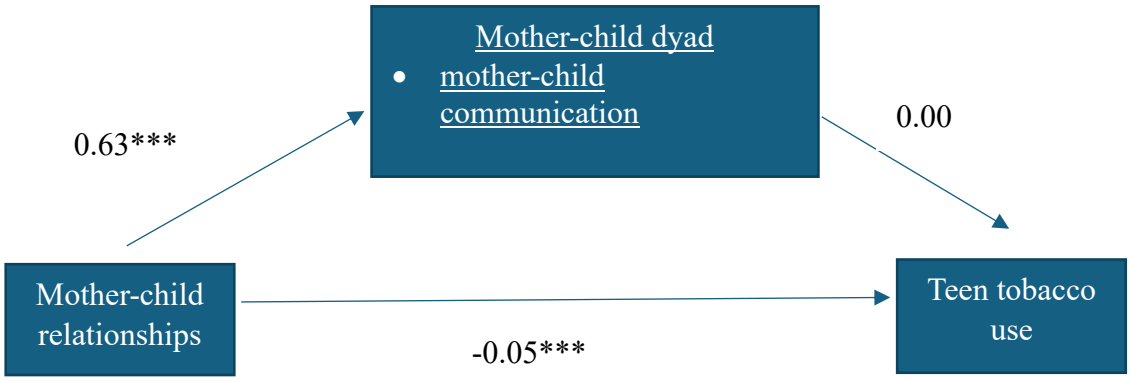
Mediation Model 3. The Mediating Effect of Mother-Child Communication on The Relationship Between Caregiver-Child Relationship and Teen Tobacco Use (N = 3170)

Description (coefficient label)	**b**	**SE**	**P-value**	**CI**
The direct effect of the mother-child relationship on teen tobacco use.	-.05***	.01	.000	-.08; .02
Indirect effect (mediation model)	-.00	.01	.909	-.02; .01
Effect of mother-child relationship on mother-child communication.	.63***	.02	.000	.60; .66
Effect of mother-child communication on teen tobacco use.	-.00	.01	.909	-.02; -.02
Total effect of the mother-child relationship on teen tobacco use	-.05***	.01	.000	-.07; - .03

Notes. *p <.05; ** p <.01; *** p <.001; Std. Err of indirect effect was calculated using Bootstrap Unstandardized coefficients are shown in the table.

Figure 3.

The hypothesized model for the mother-child dyad.



Hypothesis 4: The impact of mother-child communication on reducing teen tobacco use will differ significantly from the impact of father-child communication.

Table 7 reports the gender difference in the effect of mother-child and father-child communication on teen tobacco use. A single structural equation model (SEM) was used to test the gender-specific difference in the effect of mother-child and father-child communication on reducing teen tobacco use. The results are presented in Table 7. As this model comprehended all possible links, it was a saturated model with the perfect fit measure (i.e., zero degrees of freedom). The result showed that this model accounted for 36.77% of the variance in mother-child communication, 57.14% of the variance in father-child communication, and 6.09% variance in teen tobacco use. As shown in (Table 7) the effect of mother-child communication on teen tobacco use was ($b = -.03$, $p<.001$) statistically significant.

This suggests that for every one-unit increase in mother-child communication teen tobacco use is expected to decrease by 0.03 units. This suggests that effective mother-child communication is associated with reduced teen tobacco use. Similarly, the effect of father-child communication on teen tobacco use was ($b = -.02$, $p>.001$) not statistically significant. While the effect is not significant, it suggests a potential negative association between father-child

communication and teen tobacco use. This implies that effective father-child communication reduces teen tobacco use but the result is not statistically significant. This suggests that there is insufficient evidence to conclude that there is a significant relationship between father-child communication and teen tobacco use in the study.

In summary, these results indicate variation in the impact of mother-child and father-child communication on teen tobacco use. The results suggest that improvement in mother-child communication is more clearly associated with a reduction in teen tobacco use than improvement in father-child communication. This could suggest that the pattern of communication with mothers may play a more critical role in influencing teen behavior regarding tobacco use. Both father-child and mother-child may play a role in predicting teen tobacco use. Mother-child communication appears to have a stronger and more significant effect compared to father-child communication. Therefore, in support of the hypothesis, there was a gender difference in the effect of mother-child and father-child communication in the study.

Table. 7.

The Effect of Father-child and Mother-child Communication on Teen Tobacco Use (N = 2382)

DV = Teen tobacco use				
Variables	b	SE	P-value	CI
Father-child communication	-.02	.01	.063	-.03; .00
Mother-child communication	-.03*	.01	.010	-.05; -.01

Notes. *p <.05; ** p <.01; *** p <.001; Std. Err of indirect effect was calculated using Bootstrap Unstandardized coefficients are shown in the table.

CHAPTER V
DISCUSSION

Caregivers play a crucial role as influencers in the development of teenagers, shaping both positive and negative behavior, including their engagement in tobacco use. Guided by family systems theory, this study examined how caregiver-child relationships, parental monitoring, and parent-child communication interplay influence the tobacco use of teenagers growing up in families with fewer resources. This study used a secondary data analysis to assess the mediation role of parental monitoring and parent-child communication on the relationship between the caregiver-child relationship and teen tobacco use behavior of children growing up in the future family and child wellbeing study. I examined the impact of the caregiver-child relationship on teen tobacco use. I examined the mediating effect of parental monitoring and parent-child communication. Lastly, I examined the gender-specific difference in the impact of parental communication on teen tobacco use. The research results partially support the hypotheses. Caregiver-child relationships were found to predict teen tobacco use. Also, parental monitoring was found to mediate the relationship between caregiver-child relationship and teen tobacco use.

On the contrary, parent-child communication was not found to mediate the relationship between caregiver-child relationships and teen tobacco use. However, variation existed in the gender-specific difference in the effect of father-child and mother-child communication in influencing teen tobacco use. At the same time, both father-child and mother-child may play a role in predicting teen tobacco use. Mother-child communication appears to have a stronger and more significant effect compared to father-child communication. The following sections include the discussion of findings, limitations, direction for future research, implications for the formulation of public policies and programs, and conclusions.

Caregiver-Child Relationships and Teen Tobacco Use

The first research question was concerned with how the quality of caregiver-child relationships influences teen tobacco use. Teen tobacco use is known to have deleterious long-term consequences for teenagers. In support of the hypothesis, the results of this study indicate that there is a significant negative relationship between caregiver-child relationships, such as closeness, and the prevalence of tobacco use among teenagers. The significance of caregiver-child relationships in adolescent development and behavior is crucial in potentially reducing teen tobacco use. The result of this study is consistent with current literature that teenagers with positive relationships with their caregivers were associated with teen tobacco use (Collins & Laursen, 2004; Branstetter et al., 2009; Julan et al., 2022; Imrie et al., 2021). Early adolescence is characterized by identity formation and a push for independence (Branstetter et al., 2009). This period can be difficult for families because adolescents negotiate their autonomy. As such, adolescence is a critical period to intervene in to prevent substance use dependence in later life.

Therefore, the result of this study found that a greater caregiver-child relationship, such as closeness, can predict less tobacco use among teenagers. The closeness and emotional bonds with the caregiver can provide teenagers with the emotional support necessary to navigate the challenges of adolescence (Chaplin et al., 2012; Brewer, 2017). This support can help teenagers to manage stress and navigate emotions in healthy ways. As a result, they are reducing the likelihood of turning to tobacco use as a coping mechanism. Moreover, a greater quality of the caregiver-child relationship plays a critical role in shaping teenagers' decision-making processes and tobacco use behavior (Abar & Turrisi 2008). When parents establish a good relationship, such as closeness and emotional bonding with their child, the child is less likely to do things they know their parent would disagree.

The study findings suggest that enhanced caregiver-child relationships can act as a protective factor against tobacco use during these formative years (Lac et al., 2011; Tharp & Noonan, 2012). Furthermore, the link between positive caregiver-child relationships and teen tobacco use found in this study aligns with broader theories of adolescent development. Such relationships can foster an environment where teens feel supported, and understood and are guided on the danger of substance use, decreasing their inclination towards risky behavior as a means of seeking autonomy or approval from peers (Hodder et al., 2016; El Kazdouh et al., 2018). Hence, a positive caregiver-child relationship is conducive to the positive and constructive development of teenagers (Julan et al., 2022 & Imrie et al., 2021).

The Mediating Effect of Parental Monitoring

The second research question was whether the caregiver-child relationship influences teen tobacco use indirectly through parental monitoring. This influence was explored by examining the effect of caregiver-child relationships on parental monitoring, the effect of parental monitoring on teen tobacco use, and the direct effect of caregiver-child relationships on teen tobacco use. Consistent with the hypothesis, parental monitoring was found to mediate the relationship between caregiver-child relationship and teen tobacco use. This finding suggests that parental monitoring serves as a critical channel through which the caregiver-child relationship impacts teen tobacco use. Parental monitoring effectiveness in mediating this relationship is understood through parent knowledge about a child's physical whereabouts, for example, whom the child spent their time with, whether it is at school or during extracurricular activities; it reflects a parent's ability to gather information, establish rules, enforce acceptable boundaries that influence their teenager's behavior (Stattin & Kerr, 2000; Tharp & Noonan, 2012) to deter from tobacco use behavior.

This multi-dimensional component of parental monitoring is consistent with the framework proposed by Stattin and Kerr (2000), who emphasized the importance of parental tracking of teen activities and parental knowledge. Previous studies have consistently shown that when parents are knowledgeable about their children's activities and peers, they can more effectively enforce rules and boundaries that discourage tobacco use (Griffin et al., 2000; Lac & Cranes, 2009; Rusby et al., 2018). The findings of this study support this literature by re-enforcing how active parental rules and established boundaries about curfews or how late teens can stay out late at night, especially when it is jointly decided between parent and their teen, can mitigate opportunities for tobacco use among teenagers.

Additionally, the findings from this study reflect a balanced level of parental monitoring between parent and their teen, demonstrating that a higher quality caregiver relationship enhances the likelihood of teens disclosing accurate information about their activities when parental monitoring is not done in a manipulative way and does not impose on adolescent independence since they are an active participant in the decision-making process (parent and teen jointly decide on who teen can hang out with and rules about curfew). Hence, increasing the effectiveness of parental monitoring in preventing tobacco use.

Furthermore, the result of this study aligns with the core tenets of the family systems theory which posits that the family is a set of interconnected systems that are interrelated where changes in one part of the system affect the entire family unit (Broderick, 1993). In the context of this study, the caregiver-child relationship and parental monitoring represent an integral component of the family system that collectively influences teen tobacco use. The interrelated relationship between parental monitoring and the caregiver-child relationship creates an essential link between caregivers and teenagers, potentially protecting teens against tobacco use (Lander

et al., 2013). The interrelatedness that exists within the family system for example between caregiver-child relationship quality, parental monitoring, and teen tobacco use in this study is consistent with previous research indicating that a positive parent-child relationship and effective monitoring are key in substance use prevention (Gordon, 2020; Mills et al., 2021).

Moreover, a strong parent-child relationship can provide the foundation for effective monitoring involving caregivers being attentive to their child's actions and behaviors through surveillance (Kerr & Stattin, 2000). Caregivers with a relationship with their children are more inclined to engage in their child's life, effectively monitoring their activities and behaviors. The findings of this study extend the existing literature by providing empirical support for the mediating effect of parental monitoring among children from the Future of Family and Child Wellbeing Study who are likely to experience poverty and negative health outcomes.

Mediating Effect of Parent-child Communication.

The third research question was in two parts. Firstly, it focuses on how father-child relationship dyads independently influence teen tobacco use indirectly through father-child communication. For the father-child dyad, this influence was explored by examining the effect of father-child relationships on father-child communication, the effect of father-child communication on teen tobacco use, and the direct effect of father-child relationships on teen tobacco use. Contrary to the hypothesis, the findings of this study show that father-child communication did not mediate the relationship between the quality of the father-child relationship and teen tobacco use. This suggests that the father-child relationship did not influence teen tobacco use through the lens of father-child communication.

There is a lack of support for the hypothesis that father-child communication mediates the association between father-child relationship quality and teen tobacco use despite the

observed improvement in father-child communication with increased father-child relationship quality. This finding is consistent with broader literature that emphasizes the importance of relationship quality in fostering open communication (Huizinga et al., 2005). However, this increase in communication did not impact teen tobacco use. At the same time, this may suggest that not all improved communication necessarily involves discussion that directly influences behavior such as tobacco use. This finding does not necessarily mean that father-child communication is unimportant; rather, the content of the communication might not be clear. A recent study (Broun et al., 2021; Opara et al., 2019; & Shih et al., 2020) has demonstrated the protective effect of specific parental anti-smoking communications. These findings emphasized that the content of communication, particularly messages that articulate anti-smoking expectations and discuss the health risks associated with smoking, is critical in mitigating teen smoking behavior. One explanation for not finding a significant mediating effect of father-child communication in the father-child relationship dyad might be due to the fact that the measure used in this study did not specifically address the content of father-child communication regarding tobacco use. These measures might explain the lack of observed impacts of father-child communication on teen tobacco use.

This study result is consistent with the perspective that while general communication is essential, the content of these interactions, especially concerning health behavior, is paramount (Carver et al., 2017; Hiemstra et al., 2017). The broader literature on paternal influence indicates that the presence of a positive father-child relationship is crucial for preventing a range of negative outcomes, including drug misuse and delinquency (Hetherington & Stanley-Hegan, 1997; Brotherson et al., 2003). While the result of this study focused on tobacco use, the findings from other studies suggest that the absence of a good quality relationship may place teens at a

greater risk of substance dependency. Therefore, even if father-child communication did not directly mediate tobacco use in this study, the quality of the father-child relationship remains a critical component of teen wellbeing.

Similarly, for the mother-child relationship dyads, the second part of the hypothesis was whether the mother-child relationship influences teen tobacco use indirectly through mother-child communication. This hypothesis was explored by examining the effect of mother-child relationships on mother-child communication, the effect of mother-child communication on teen tobacco use, and the direct effect of mother-child relationships on teen tobacco use. The results show that the mother-child relationship did not influence teen tobacco use through the lens of mother-child communication. This suggests that while mother-child relationship quality directly influences teen tobacco use, the pathway through mother-child communication is not a significant mediator in this relationship. Contrary to the hypothesis, this finding is not consistent with previous studies that found mother-child communication to be a significant predictor of teen tobacco use (Miller-Day et al., 2002; Metzger et al., 2013; Luk et al., 2010).

However, the findings of significant positive relationship quality and mother-child communication in this study reflect the importance of strong relational bonds in fostering open and effective communication. This finding is consistent with previous literature indicating that higher-quality parent-child relationships are characterized by a higher level of communication (Huizinga et al., 2005; Maggi et al., 2014; Metzger et al., 2013). Luk et al., (2010) assert that the quality of communication between parents and children serves as a reflection of their relationship quality. In the context of this study suggests that improving the quality of the mother-child relationship could enhance mother-child communication without having a direct impact on teen tobacco use through this pathway.

More so, an explanation of the lack of significant mediating effects of mother-child communication on teen tobacco use, despite the direct effects of the mother-child relationship on teen tobacco use, points to the complex familiar factors that may be influencing teen tobacco use. Another explanation might be that the measure used in this study did not specifically address the content of mother-child communication regarding tobacco use. Additionally, mother-child relationships, such as emotional bonding and closeness, might exert a greater influence on mother-child communication in this study. This is reflected in the direct effect of the mother-child relationship on teen tobacco use.

In summary, the direct relationship between the father-child relationship and teen tobacco use is not found in the father dyad model, nor is the mediating effect of father-child communication. However, while the direct relationship between mother-child relationship is evident, the mediating role of mother-child communication is not supported by the findings of this study. This suggests that interventions aimed at reducing teen tobacco use should focus on enhancing the quality of the caregiver-child relationship (both father-child and mother-child dyads) and ensuring the content of communication is specifically targeted at discussing the risks and consequences of tobacco use.

The Gender-Specific Difference of Mother-Child and Father-Child Communication on Teen Tobacco Use.

Research question four was concerned with whether there are gender-specific differences in the effects of father-child communication and mother-child communication on teen tobacco use. This influence was examined through the effects of both father-child communication and mother-child communication on teen tobacco use. The results of this study suggest that both father-child and mother-child communication differ in their role in predicting teen tobacco use.

Mother-child communication appears to have a stronger and more significant effect compared to father-child communication. Therefore, in support of the hypothesis, there was a gender difference in the effect of mother-child and father-child communication in the study.

The result of this study aligns with the family systems theory that places significant emphasis on communication within the family unit, considering it a fundamental element of family functioning (Yerby, 1995). Additionally, the family systems theory proposes that the family consists of subsystems, for example, father-child and mother-child subsystems that operate within the larger family system (Broderick, 1993). The identification of gender-specific differences in the effect of father-child and mother-child communication on teen tobacco use provides an understanding of the role of this family subsystem such as the father-child communication and mother-child communication in influencing teen tobacco use within the caregiver-child relationship. This result of this study is consistent with recent studies that have found that parent-child communication is negatively related to adolescents' substance use (P-wang et al., 2022; Miller-day et al., 2008; Eisenberg et al., 2019; Ebersole et al., 2014; Huansuriya et al., 2014; Neumark-strainer, 2006). Conversely, poor parent-child communication has positively affected adolescents' substance use (Luk et al., 2010).

Furthermore, previous literature also indicates a gender disparity in the effect and involvement of father-child dyads and mother-child dyads in these communication processes (Rosnati et al. 2007; Williams & Kelly, 2005), with father often perceived as less effective and involved in the context of family relationships (Stoker & Swadi, 1990, Williams & Kelly, 2005). Mothers, on the other hand, are more likely to engage in open communication, which is negatively associated with teen smoking (Branstteter et al., 2009). The findings of this study suggest that the difference that exists between father-child communication dyads and mother-

child communication dyads may be attributed to variations in communication style and the quality of the relationships that exist within the parent-child dyadic relationships.

For instance, the findings from this study reflect that the mother-child relationship was more significant in its effect on mother-child communication when compared to the father-child relationship in impacting teen tobacco use. This finding is consistent with existing literature that suggests that mother and father have a unique influence on teen substance use, potentially attributed to the differences in communication styles and interaction in the parent-child relationship (Rosnati et al., 2007; Williams & Kelly, 2005; Metzger et al., 2011; Luk et al., 2010). Mothers are generally more open in their communication, discussing a broader range of topics and fostering an environment where teens feel more comfortable initiating discussion about smoking behavior (Rosnati et al., 2007). This open communication is crucial for providing teens with the support and guidance needed to navigate the risk of tobacco use.

In contrast, father-child communication, while important, may not have the same impact due to differences in communication patterns and potentially less emotional closeness compared to the mother-child dyad (Rosnati et al., 2007). Fathers' behavior towards drug use and their communication style can influence their children's behavior, but the effect may not be as pronounced as that of mothers who tend to engage in more comprehensive conversations with their children (Miller-day et al., 2002).

Limitations and Future Directions

This study is limited in several ways. First, this study used only one wave of data from the Future Family and Child Wellbeing Study. The study cannot make a causal interpretation of the mediation effect. Future studies should employ longitudinal methods to explain the changing dynamics of the caregiver-child relationship, parental monitoring and parental communication,

and teen tobacco use. Second, the use of a secondary dataset limited the ability of the study to fully capture the concept of the caregiver-child relationship and parent-child communication due to the constraints of the questions included in the dataset.

As a result, the study was only able to use a single question to measure both the father-child dyad and mother-child dyad, and one single question was used to measure different dimensions of father-child communication and mother-child communication. This might explain why both father-child and mother-child communication did not mediate the relationship between caregiver-child relationship and teen tobacco use. Third, the study findings are based on a specific dataset from the Future of Family and Child Wellbeing Study that comprises unmarried partners, which might limit the generalization of the results to other populations. Hence, future studies should aim to replicate this study in diverse familial structures. Fourth, the parent-child communication and parental monitoring in this study reflect teens' perspectives. To a large degree, teen impressions are important in helping to comprehend those factors they consider significant in the caregiver-child relationship. However, future studies examining caregiver-child relationship dyads might include parental impression of this aspect of caregiver-child relationship in addition to teen impression. Caregiver-child discrepancies in perspective may assist in identifying communication and monitoring processes that contribute to teen tobacco use. Lastly, future research should include specific topics and messages conveyed in the caregiver-child relationship about tobacco use could inform more effective prevention strategies.

Implications for Programs and Policies

The findings on the effects of the caregiver-child relationship and the effect of parental monitoring on teen tobacco use offer evidence to support the development of government programs, initiatives, and policies. First, the detection of the mediating effect of parental

monitoring and the caregiver-child relationship in reducing teen tobacco use provides evidence in support of prevention and intervention programs aimed at reducing teen tobacco use and promoting positive caregiver-child relationships. Moreover, the study findings on the gender variation in the impact of parent-child communication on teen tobacco use, which is more pronounced in mother-child communication dyads than in father-child communication dyads, reflect the need for targeted intervention that considers different strategies aimed at reducing tobacco use among teens, should leverage the unique strength of both mother-child and father-child communication, and promote open communication and emotional closeness as key components of these efforts. Intervention should encourage fathers to adopt more open and engaging communication styles while reinforcing the already effective communication practices among mothers while considering the family unit as a dynamic and interconnected system.

Conclusions

Given that existing literature consistently shows that strong caregiver-child relationships, positive parent-child communication, and parental monitoring reduce the likelihood of tobacco use (DiClemente et al., 2001; Kerr & Stattin, 2001; Wang et al., 2013), the specific protective mechanism through which this critical family processes for example, parental communication, and parental monitoring within caregiver-child relationships and how they affect teen tobacco use, with particular attention given to gender-specific differences, need to be examined. Additionally, previous studies have not examined the mediation effects of parent-child communication and parental monitoring among children from Future Families and Child Wellbeing. In this light, this study adds to the literature by taking a strengths perspective to examine the mediating effects of parental monitoring and parent-child communication (e.g.,

father-child dyads and mother-child dyads) on teen tobacco use behavior. This study contributes to the existing literature in several ways.

First, it adds to the literature by revealing the mediating effect of parental monitoring in influencing teen tobacco use. The findings show that the mediating role of parental monitoring may exert an influence on the caregiver-child relationship and teen tobacco use. Second, this study adds to the literature by taking a strengths perspective to uncover the protective effects of parental communication in influencing teen tobacco use for both mother-child dyads and father-child dyads. However, consistent with existing literature (Luk et al. 2010; Metzger et al., 2013), the study identified a gender-specific difference in the effect of mother-child and father-child communication on teen tobacco use, although more pronounced with the effect of mother-child communication. These findings indicate a comprehensive understanding of the parental influence on teen behavior, emphasizing the collective impact of the caregiver-child relationship, parental monitoring, and parental communication in influencing teen tobacco use and providing the mechanisms behind such relationships. Third, this study provides evidence for the formulation of government policies and programs. The findings suggest that researchers and practitioners should continue to investigate the protective function of these family practices in addressing teen tobacco use challenges. They should design focused interventions to diminish teen tobacco use and maximize the impact of parenting practices for fostering healthy teen development, particularly emphasizing early intervention before the age of 15.

APPENDIXES

APPENDIX A

WAVE 15 TEEN SURVEY

Appendix A

Wave 15 Teen Survey

Sex

1. What is your sex?

(1= Male, 2= Female)

1	2

Race/Ethnicity

2. What is your race?

Race/Ethnicity
White
Black/African American
Hispanic/Latino
Asian
Others only, non-Hispanic
Multi-race

3. **Education**

Education Level
Less than high school
High school or equivalent
College
Graduate

Teen Tobacco use

Scale for teen tobacco use

(1= yes, 2= no)

Variables	*1*	*2*
1. Do you ever use cigarettes?		
2. Are cigarettes easily available to you in the home?		
3. Have your Parents ever given you cigarette to smoke?		

1b.

4. How old were you when you smoked a whole cigarette for the first time?

   4 --- 5-----, 6-----, 7-------, 8------, 9------, 10------, 11------, 12-----, 13------, 14------, 15---

5. During the past 30 days, how often did you smoke cigarettes?

   (1= never, 2 =once or twice, 3= three to five days a week, 4= six to seven days a week)

1	2	3	4

Parental Monitoring

Scale for parental monitoring as reported by teen.

1.

(1= parent decide, 2= teen decide, 3= parent and teen jointly decide)

Variables	1	2	3
1. Who decides how late you can stay out at night?			
2. Who decides what kind of TV shows/movies you can watch?			
3. Decides who you can hang out with?			

Caregiver-child Relationship

(1 =extremely close, 2= quite close, 3= fairly close, 4= not very close)

Variables	1	2	3	4
1. How close do you feel to biological Mother?				
2. How close do you feel to biological Father?				

Father-child communication

3. How well do you and biological father share ideas/talk?

(1= extremely well, 2= quite well, 3= fairly well, 4 = not very well)

1	*2*	*3*	*4*

Mother-child communication

1. How well do you and biological mother share ideas/talk?

(1= extremely well, 2= quite well, 3= fairly well, 4 = not very well)

1	*2*	*3*	*4*

APPENDIX B

R SYNTAX FOR ANALYSIS RESULTS

Appendix B

R Syntax for Analysis Results

R Markdown

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see http://rmarkdown.rstudio.com.

When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

```
# Install haven package
library(foreign)
library(haven)
Ola_Dataset <- read.spss("Olan_thesisDATA_subset_R.sav", to.data.frame
= TRUE)
model <- '
  # Paths from IVs to Mediator
  monitor ~ a1*close_f + a2*close_m + c3*ofte_s_p

  # Path from Mediator to DV
  ofte_s ~ b*monitor + c1*close_f + c2*close_m + c4*ofte_s_p

  # specify the indirect effects
  indirect_effect_close_f := a1*b
  indirect_effect_close_m := a2*b

  # Total effect of close_f and close_m on ofte_s
  total_effect_close_f := c1 + (a1*b)
  total_effect_close_m := c2 + (a2*b)
'
str(Ola_Dataset)

## 'data.frame':    4898 obs. of  12 variables:
##  $ idnum   : chr  "0001" "0002" "0003" "0004" ...
##  $ ever_s  : num  0 0 0 0 NA 0 NA 0 0 0 ...
##  $ ofte_s  : num  0 0 0 0 NA 0 NA 0 0 0 ...
##  $ ciga_s  : num  0 0 0 0 NA 0 NA 0 0 0 ...
##  $ close_m : num  4 4 1 4 NA 3 NA 4 1 4 ...
##  $ close_f : num  4 4 1 NA NA NA NA 1 1 4 ...
```

```
##  $ comm_m  : num  3 4 2 4 NA 3 NA 3 4 4 ...
##  $ comm_f  : num  3 3 1 NA NA NA NA NA 1 4 ...
##  $ monitor : num  2 2 2 2 NA ...
##  $ ever_s_p: num  1 0 1 0 1 1 NA 0 0 0 ...
##  $ ofte_s_p: num  0 0 0 0 3 2 NA 0 0 0 ...
##  $ ciga_s_p: num  NA 0 NA 0 2 1 NA 0 0 0 ...
##  - attr(*, "codepage")= int 65001
```

```
library(lavaan)
```

```
## This is lavaan 0.6-17
## lavaan is FREE software! Please report any bugs.
```

```
# Fit the model with bootstrapping
fit <- sem (model, data = Ola_Dataset, se = "bootstrap", bootstrap = 1
000)

# Summary call
summary(fit, fit.measures = TRUE, standardized = TRUE)
```

```
## lavaan 0.6.17 ended normally after 1 iteration
##
##   Estimator                                         ML
##   Optimization method                           NLMINB
##   Number of model parameters                         9
##
##                                                   Used       Total
##   Number of observations                          2845        4898
##
## Model Test User Model:
##
##   Test statistic                                 0.000
##   Degrees of freedom                                 0
##
## Model Test Baseline Model:
##
##   Test statistic                               217.537
##   Degrees of freedom                                 7
##   P-value                                        0.000
##
## User Model versus Baseline Model:
##
##   Comparative Fit Index (CFI)                    1.000
##   Tucker-Lewis Index (TLI)                       1.000
##
## Loglikelihood and Information Criteria:
##
```

```
##   Loglikelihood user model (H0)              -2251.650
##   Loglikelihood unrestricted model (H1)      -2251.650
##
##   Akaike (AIC)                                4521.300
##   Bayesian (BIC)                              4574.880
##   Sample-size adjusted Bayesian (SABIC)       4546.284
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.000
##   90 Percent confidence interval - lower         0.000
##   90 Percent confidence interval - upper         0.000
##   P-value H_0: RMSEA <= 0.050                       NA
##   P-value H_0: RMSEA >= 0.080                       NA
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.000
##
## Parameter Estimates:
##
##   Standard errors                             Bootstrap
##   Number of requested bootstrap draws             1000
##   Number of successful bootstrap draws            1000
##
## Regressions:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  St
d.all
##   monitor ~
##     close_f   (a1)    0.017    0.006    2.913    0.004    0.017
0.054
##     close_m   (a2)    0.089    0.009    9.761    0.000    0.089
0.213
##     ofte_s_p  (c3)   -0.000    0.006   -0.065    0.948   -0.000   -
0.001
##   ofte_s ~
##     monitor    (b)   -0.063    0.025   -2.555    0.011   -0.063   -
0.061
##     close_f   (c1)   -0.016    0.006   -2.477    0.013   -0.016   -
0.050
##     close_m   (c2)   -0.034    0.010   -3.518    0.000   -0.034   -
0.078
##     ofte_s_p  (c4)    0.026    0.008    3.367    0.001    0.026
0.079
##
## Variances:
```

```
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  St
d.all
##    .monitor           0.123    0.004   31.556    0.000    0.123
0.949
##    .ofte_s            0.135    0.018    7.615    0.000    0.135
0.977
##
## Defined Parameters:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  St
d.all
##     indrct_ffct_c_   -0.001    0.001   -1.790    0.073   -0.001   -
0.003
##     indrct_ffct_c_   -0.006    0.002   -2.447    0.014   -0.006   -
0.013
##     ttl_ffct_cls_f   -0.017    0.006   -2.664    0.008   -0.017   -
0.053
##     ttl_ffct_cls_m   -0.039    0.010   -4.102    0.000   -0.039   -
0.091
```

```r
# Get parameter estimates with confidence intervals
estimates <- parameterEstimates(fit, ci = TRUE)

# View the estimates along with confidence intervals
print(estimates)
```

```
##                        lhs op       rhs                   label
est    se
## 1                  monitor  ~   close_f                      a1  0.
017 0.006
## 2                  monitor  ~   close_m                      a2  0.
089 0.009
## 3                  monitor  ~  ofte_s_p                      c3  0.
000 0.006
## 4                   ofte_s  ~   monitor                       b -0.
063 0.025
## 5                   ofte_s  ~   close_f                      c1 -0.
016 0.006
## 6                   ofte_s  ~   close_m                      c2 -0.
034 0.010
## 7                   ofte_s  ~  ofte_s_p                      c4  0.
026 0.008
## 8                  monitor ~~   monitor                          0.
123 0.004
## 9                   ofte_s ~~    ofte_s                          0.
135 0.018
## 10                 close_f ~~   close_f                         1.
```

```
395 0.000
## 11                close_f ~~   close_m                          0.
139 0.000
## 12                close_f ~~  ofte_s_p                        -0.
106 0.000
## 13                close_m ~~   close_m                          0.
737 0.000
## 14                close_m ~~  ofte_s_p                        -0.
031 0.000
## 15               ofte_s_p ~~  ofte_s_p                          1.
280 0.000
## 16 indirect_effect_close_f :=      a1*b indirect_effect_close_f -0.
001 0.001
## 17 indirect_effect_close_m :=      a2*b indirect_effect_close_m -0.
006 0.002
## 18    total_effect_close_f := c1+(a1*b)    total_effect_close_f -0.
017 0.006
## 19    total_effect_close_m := c2+(a2*b)    total_effect_close_m -0.
039 0.010
##         z pvalue ci.lower ci.upper
## 1   2.913  0.004    0.005    0.028
## 2   9.761  0.000    0.072    0.109
## 3  -0.065  0.948   -0.011    0.011
## 4  -2.555  0.011   -0.113   -0.014
## 5  -2.477  0.013   -0.028   -0.003
## 6  -3.518  0.000   -0.053   -0.015
## 7   3.367  0.001    0.011    0.042
## 8  31.556  0.000    0.115    0.132
## 9   7.615  0.000    0.103    0.172
## 10     NA     NA    1.395    1.395
## 11     NA     NA    0.139    0.139
## 12     NA     NA   -0.106   -0.106
## 13     NA     NA    0.737    0.737
## 14     NA     NA   -0.031   -0.031
## 15     NA     NA    1.280    1.280
## 16 -1.790  0.073   -0.002    0.000
## 17 -2.447  0.014   -0.010   -0.001
## 18 -2.664  0.008   -0.028   -0.004
## 19 -4.102  0.000   -0.059   -0.021

model2 <- '
  # Path from IV to Mediator
  comm_f ~ a1*close_f + c3*ofte_s_p

  # Path from Mediator (and IV and covariate) to DV
  ofte_s ~ b*comm_f + c1*close_f + c4*ofte_s_p
```

```
  # Indirect effect of close_f on ofte_s through comm_f
  indirect_effect := a1*b

  # Total effect of close_f on ofte_s
  total_effect := c1 + (a1*b)
'

library(lavaan)

# Fit the model with 1000 bootstrap samples
fit2 <- sem(model2, data = Ola_Dataset, se = "bootstrap", bootstrap =
1000)

summary(fit2)
```

```
## lavaan 0.6.17 ended normally after 1 iteration
##
##   Estimator                                         ML
##   Optimization method                           NLMINB
##   Number of model parameters                         7
##
##                                                   Used       Total
##   Number of observations                          2543        4898
##
## Model Test User Model:
##
##   Test statistic                                 0.000
##   Degrees of freedom                                 0
##
## Parameter Estimates:
##
##   Standard errors                             Bootstrap
##   Number of requested bootstrap draws             1000
##   Number of successful bootstrap draws            1000
##
## Regressions:
##                    Estimate  Std.Err  z-value  P(>|z|)
##   comm_f ~
##     close_f   (a1)    0.720    0.013   56.299    0.000
##     ofte_s_p  (c3)   -0.005    0.014   -0.356    0.722
##   ofte_s ~
##     comm_f     (b)   -0.013    0.009   -1.483    0.138
##     close_f   (c1)   -0.011    0.009   -1.253    0.210
##     ofte_s_p  (c4)    0.025    0.008    3.104    0.002
##
```

```
## Variances:
##                    Estimate  Std.Err  z-value  P(>|z|)
##    .comm_f            0.594    0.019   31.063    0.000
##    .ofte_s            0.122    0.017    7.186    0.000
##
## Defined Parameters:
##                    Estimate  Std.Err  z-value  P(>|z|)
##     indirect_effct   -0.009    0.006   -1.478    0.139
##     total_effect     -0.020    0.007   -2.837    0.005
```

```
# Fitted model object with bootstrapping
estimates <- parameterEstimates(fit2, ci = TRUE) # for 95% CI

# View the estimates along with 95% confidence intervals
print(estimates)
```

```
##                lhs op       rhs           label    est    se      z
pvalue
## 1           comm_f  ~   close_f              a1  0.720 0.013 56.299
0.000
## 2           comm_f  ~  ofte_s_p              c3 -0.005 0.014 -0.356
0.722
## 3           ofte_s  ~    comm_f               b -0.013 0.009 -1.483
0.138
## 4           ofte_s  ~   close_f              c1 -0.011 0.009 -1.253
0.210
## 5           ofte_s  ~  ofte_s_p              c4  0.025 0.008  3.104
0.002
## 6           comm_f ~~    comm_f                  0.594 0.019 31.063
0.000
## 7           ofte_s ~~    ofte_s                  0.122 0.017  7.186
0.000
## 8          close_f ~~   close_f                  1.192 0.000     NA
NA
## 9          close_f ~~  ofte_s_p                 -0.079 0.000     NA
NA
## 10        ofte_s_p ~~  ofte_s_p                  1.270 0.000     NA
NA
## 11 indirect_effect :=      a1*b indirect_effect -0.009 0.006 -1.478
0.139
## 12    total_effect := c1+(a1*b)    total_effect -0.020 0.007 -2.837
0.005
##    ci.lower ci.upper
## 1     0.694    0.745
## 2    -0.033    0.023
## 3    -0.030    0.005
```

```
## 4    -0.028    0.005
## 5     0.010    0.042
## 6     0.555    0.632
## 7     0.089    0.158
## 8     1.192    1.192
## 9    -0.079   -0.079
## 10    1.270    1.270
## 11   -0.022    0.003
## 12   -0.036   -0.007
```

```
model3 <- '
  # Path from IV to Mediator
  comm_m ~ a1*close_m + c3*ofte_s_p

  # Path from Mediator (and IV and covariate) to DV
  ofte_s ~ b*comm_m + c1*close_m + c4*ofte_s_p

  # Indirect effect of close_m on ofte_s through comm_m
  indirect_effect := a1*b

  # Total effect of close_m on ofte_s
  total_effect := c1 + (a1*b)
'

# Fit the model with 1000 bootstrap samples
fit3 <- sem(model3, data = Ola_Dataset, se = "bootstrap", bootstrap =
1000)

summary(fit3)
```

```
## lavaan 0.6.17 ended normally after 1 iteration
##
##   Estimator                                         ML
##   Optimization method                           NLMINB
##   Number of model parameters                         7
##
##                                                   Used       Total
##   Number of observations                          3153        4898
##
## Model Test User Model:
##
##   Test statistic                                 0.000
##   Degrees of freedom                                 0
##
## Parameter Estimates:
##
```

```
##   Standard errors                             Bootstrap
##   Number of requested bootstrap draws             1000
##   Number of successful bootstrap draws            1000
##
## Regressions:
##                    Estimate  Std.Err  z-value  P(>|z|)
##   comm_m ~
##     close_m   (a1)    0.627    0.016   39.917    0.000
##     ofte_s_p  (c3)    0.003    0.011    0.276    0.783
##   ofte_s ~
##     comm_m     (b)    0.001    0.011    0.053    0.958
##     close_m   (c1)   -0.044    0.013   -3.261    0.001
##     ofte_s_p  (c4)    0.031    0.007    4.250    0.000
##
## Variances:
##                    Estimate  Std.Err  z-value  P(>|z|)
##    .comm_m            0.501    0.013   37.908    0.000
##    .ofte_s            0.140    0.017    8.277    0.000
##
## Defined Parameters:
##                    Estimate  Std.Err  z-value  P(>|z|)
##     indirect_effct    0.000    0.007    0.053    0.958
##     total_effect     -0.043    0.010   -4.333    0.000
```

```r
# Model object with bootstrapping
estimates <- parameterEstimates(fit3, ci = TRUE)

# View the estimates along with 95% confidence intervals
print(estimates)
```

```
##                lhs op       rhs           label    est    se      z
pvalue
## 1           comm_m  ~   close_m              a1  0.627 0.016 39.917
0.000
## 2           comm_m  ~  ofte_s_p              c3  0.003 0.011  0.276
0.783
## 3           ofte_s  ~    comm_m               b  0.001 0.011  0.053
0.958
## 4           ofte_s  ~   close_m              c1 -0.044 0.013 -3.261
0.001
## 5           ofte_s  ~  ofte_s_p              c4  0.031 0.007  4.250
0.000
## 6           comm_m ~~    comm_m                  0.501 0.013 37.908
0.000
## 7           ofte_s ~~    ofte_s                  0.140 0.017  8.277
0.000
```

```
## 8          close_m ~~   close_m                  0.708 0.000     NA
NA
## 9          close_m ~~  ofte_s_p                -0.023 0.000     NA
NA
## 10        ofte_s_p ~~  ofte_s_p                 1.313 0.000     NA
NA
## 11 indirect_effect :=      a1*b indirect_effect  0.000 0.007  0.053
0.958
## 12    total_effect := c1+(a1*b)    total_effect -0.043 0.010 -4.333
0.000
##    ci.lower ci.upper
## 1     0.597    0.659
## 2    -0.020    0.025
## 3    -0.020    0.022
## 4    -0.070   -0.017
## 5     0.017    0.046
## 6     0.475    0.528
## 7     0.109    0.176
## 8     0.708    0.708
## 9    -0.023   -0.023
## 10    1.313    1.313
## 11   -0.012    0.014
## 12   -0.063   -0.024
```

```
# Run the correlation Analysis

selected_data <- Ola_Dataset[, c("ofte_s", "close_m", "close_f", "comm
_m", "comm_f", "ofte_s_p", "monitor")]

select_cor_matrix <- cor(selected_data, method = "pearson", use = "pai
rwise.complete.obs")

print(select_cor_matrix)
```

```
##               ofte_s     close_m     close_f      comm_m      comm_
f
## ofte_s    1.00000000 -0.10839564 -0.07112476 -0.06485282 -0.0598406
5
## close_m  -0.10839564  1.00000000  0.13601423  0.59805664  0.1280635
2
## close_f  -0.07112476  0.13601423  1.00000000  0.11649865  0.7145529
4
## comm_m   -0.06485282  0.59805664  0.11649865  1.00000000  0.1560293
8
## comm_f   -0.05984065  0.12806352  0.71455294  0.15602938  1.0000000
0
```

```
## ofte_s_p  0.08421332 -0.02984316 -0.07229902 -0.01169539 -0.0523469
4
## monitor  -0.06924346  0.22599448  0.08417051  0.23684040  0.1281858
5
##              ofte_s_p      monitor
## ofte_s    0.084213320 -0.069243455
## close_m  -0.029843165  0.225994481
## close_f  -0.072299017  0.084170506
## comm_m   -0.011695389  0.236840398
## comm_f   -0.052346937  0.128185848
## ofte_s_p  1.000000000 -0.008928533
## monitor  -0.008928533  1.000000000
```

```
# Assuming 'close_m' is mother-child relationship variable
# and 'close_f' is father-child relationship variable
Ola_Dataset$caregiver_child_relationship <- rowMeans(Ola_Dataset[, c("c
lose_m", "close_f")], na.rm = TRUE)

sum(is.na(Ola_Dataset$caregiver_child_relationship))
```

```
## [1] 1473
```

```
correlation_result <- cor(Ola_Dataset$caregiver_child_relationship, Ola
_Dataset$ofte_s, use = "complete.obs", method = "pearson")
print(correlation_result)
```

```
## [1] -0.1123268
```

```
# Ensure necessary packages are loaded
library(lavaan)

model <- '
  # Paths from IVs to Mediator
  monitor ~ a * caregiver_child_relationship + cov * ofte_s_p

  # Paths from Mediator to DV
  ofte_s ~ b * monitor + c * caregiver_child_relationship + cov * ofte
_s_p

  # Indirect effect (mediated effect)
  ab := a * b

  # Total effect
  total := c + ab
'
fit <- sem(model, data = Ola_Dataset, se = "bootstrap", bootstrap = 10
00)
```

```r
# Explicitly print the summary
print(summary(fit, fit.measures = TRUE, standardized = TRUE, rsquare =
TRUE))
```

```
## lavaan 0.6.17 ended normally after 15 iterations
##
##   Estimator                                         ML
##   Optimization method                           NLMINB
##   Number of model parameters                         7
##   Number of equality constraints                     1
##
##                                                   Used       Total
##   Number of observations                          3394        4898
##
## Model Test User Model:
##
##   Test statistic                                11.844
##   Degrees of freedom                                 1
##   P-value (Chi-square)                           0.001
##
## Model Test Baseline Model:
##
##   Test statistic                               185.648
##   Degrees of freedom                                 5
##   P-value                                        0.000
##
## User Model versus Baseline Model:
##
##   Comparative Fit Index (CFI)                    0.940
##   Tucker-Lewis Index (TLI)                       0.700
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)              -2906.816
##   Loglikelihood unrestricted model (H1)      -2900.895
##
##   Akaike (AIC)                                5825.633
##   Bayesian (BIC)                              5862.411
##   Sample-size adjusted Bayesian (SABIC)       5843.347
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.057
##   90 Percent confidence interval - lower         0.031
##   90 Percent confidence interval - upper         0.087
```

```
##   P-value H_0: RMSEA <= 0.050                    0.299
##   P-value H_0: RMSEA >= 0.080                    0.111
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.019
##
## Parameter Estimates:
##
##   Standard errors                             Bootstrap
##   Number of requested bootstrap draws             1000
##   Number of successful bootstrap draws            1000
##
## Regressions:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  St
d.all
##   monitor ~
##     crgvr_c_   (a)    0.084    0.009    9.052    0.000    0.084
0.183
##     ofte_s_p (cov)    0.013    0.004    3.030    0.002    0.013
0.040
##   ofte_s ~
##     monitor    (b)   -0.050    0.022   -2.293    0.022   -0.050   -
0.049
##     crgvr_c_   (c)   -0.047    0.010   -4.621    0.000   -0.047   -
0.100
##     ofte_s_p (cov)    0.013    0.004    3.030    0.002    0.013
0.039
##
## Variances:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  St
d.all
##    .monitor           0.132    0.004   36.404    0.000    0.132
0.966
##    .ofte_s            0.144    0.017    8.318    0.000    0.144
0.984
##
## R-Square:
##                    Estimate
##     monitor           0.034
##     ofte_s            0.016
##
## Defined Parameters:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  St
d.all
##     ab               -0.004    0.002   -2.178    0.029   -0.004   -
```

```
0.009
##     total            -0.052    0.010   -5.092    0.000   -0.052   -
0.109

# For bootstrap confidence intervals
estimates <- parameterEstimates(fit, level = 0.95)
print(estimates)

##                             lhs op                          rhs lab
el    est
## 1                       monitor  ~ caregiver_child_relationship
a  0.084
## 2                       monitor  ~                     ofte_s_p   c
ov  0.013
## 3                        ofte_s  ~                      monitor
b -0.050
## 4                        ofte_s  ~ caregiver_child_relationship
c -0.047
## 5                        ofte_s  ~                     ofte_s_p   c
ov  0.013
## 6                       monitor ~~                      monitor
0.132
## 7                        ofte_s ~~                       ofte_s
0.144
## 8  caregiver_child_relationship ~~ caregiver_child_relationship
0.655
## 9  caregiver_child_relationship ~~                     ofte_s_p
-0.048
## 10                     ofte_s_p ~~                     ofte_s_p
1.323
## 11                           ab :=                          a*b
ab -0.004
## 12                        total :=                        c+ab tot
al -0.052
##       se      z pvalue ci.lower ci.upper
## 1  0.009  9.052  0.000    0.066    0.102
## 2  0.004  3.030  0.002    0.004    0.021
## 3  0.022 -2.293  0.022   -0.096   -0.007
## 4  0.010 -4.621  0.000   -0.069   -0.029
## 5  0.004  3.030  0.002    0.004    0.021
## 6  0.004 36.404  0.000    0.125    0.139
## 7  0.017  8.318  0.000    0.113    0.181
## 8  0.000     NA     NA    0.655    0.655
## 9  0.000     NA     NA   -0.048   -0.048
## 10 0.000     NA     NA    1.323    1.323
```

```
## 11 0.002 -2.178  0.029   -0.008   -0.001
## 12 0.010 -5.092  0.000   -0.072   -0.033
```

```
model <- '
  # Paths from IVs to Mediator
  monitor ~ a * caregiver_child_relationship + cov * ofte_s_p

  # Paths from Mediator to DV
  ofte_s ~ b * monitor + c * caregiver_child_relationship + cov * ofte
_s_p

  # Indirect effect (mediated effect)
  ab := a * b

  # Total effect
  total := c + ab
'
fit <- sem(model, data = Ola_Dataset)

# Print summary of the SEM model with fit measures and standardized es
timates
print(summary(fit, fit.measures = TRUE, standardized = TRUE))
```

```
## lavaan 0.6.17 ended normally after 15 iterations
##
##   Estimator                                         ML
##   Optimization method                           NLMINB
##   Number of model parameters                         7
##   Number of equality constraints                     1
##
##                                                   Used       Total
##   Number of observations                          3394        4898
##
## Model Test User Model:
##
##   Test statistic                                11.844
##   Degrees of freedom                                 1
##   P-value (Chi-square)                           0.001
##
## Model Test Baseline Model:
##
##   Test statistic                               185.648
##   Degrees of freedom                                 5
##   P-value                                        0.000
##
## User Model versus Baseline Model:
```

```
##
##   Comparative Fit Index (CFI)                    0.940
##   Tucker-Lewis Index (TLI)                       0.700
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)              -2906.816
##   Loglikelihood unrestricted model (H1)      -2900.895
##
##   Akaike (AIC)                                5825.633
##   Bayesian (BIC)                              5862.411
##   Sample-size adjusted Bayesian (SABIC)       5843.347
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.057
##   90 Percent confidence interval - lower         0.031
##   90 Percent confidence interval - upper         0.087
##   P-value H_0: RMSEA <= 0.050                    0.299
##   P-value H_0: RMSEA >= 0.080                    0.111
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.019
##
## Parameter Estimates:
##
##   Standard errors                             Standard
##   Information                                 Expected
##   Information saturated (h1) model          Structured
##
## Regressions:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  St
d.all
##   monitor ~
##     crgvr_c_   (a)    0.084    0.008   10.833    0.000    0.084
0.183
##     ofte_s_p (cov)    0.013    0.004    3.264    0.001    0.013
0.040
##   ofte_s ~
##     monitor    (b)   -0.050    0.018   -2.819    0.005   -0.050   -
0.049
##     crgvr_c_   (c)   -0.047    0.008   -5.796    0.000   -0.047   -
0.100
##     ofte_s_p (cov)    0.013    0.004    3.264    0.001    0.013
0.039
```

```
##
## Variances:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  St
d.all
##    .monitor          0.132    0.003   41.195    0.000    0.132
0.966
##    .ofte_s           0.144    0.003   41.195    0.000    0.144
0.984
##
## Defined Parameters:
##                   Estimate  Std.Err  z-value  P(>|z|)   Std.lv  St
d.all
##     ab              -0.004    0.002   -2.728    0.006   -0.004   -
0.009
##     total           -0.052    0.008   -6.411    0.000   -0.052   -
0.109
```

```
model <- '
  # Paths from IVs to DV
  ofte_s ~ c * caregiver_child_relationship + cov * ofte_s_p

  # Direct effect
  direct := c
'

# Fit the SEM model
fit <- sem(model, data = Ola_Dataset)

# Print summary of the SEM model with fit measures and standardized es
timates
print(summary(fit, fit.measures = TRUE, standardized = TRUE))
```

```
## lavaan 0.6.17 ended normally after 1 iteration
##
##   Estimator                                         ML
##   Optimization method                           NLMINB
##   Number of model parameters                         3
##
##                                                   Used       Total
##   Number of observations                          3394        4898
##
## Model Test User Model:
##
##   Test statistic                                 0.000
##   Degrees of freedom                                 0
##
```

```
## Model Test Baseline Model:
##
##   Test statistic                                64.527
##   Degrees of freedom                                 2
##   P-value                                        0.000
##
## User Model versus Baseline Model:
##
##   Comparative Fit Index (CFI)                    1.000
##   Tucker-Lewis Index (TLI)                       1.000
##
## Loglikelihood and Information Criteria:
##
##   Loglikelihood user model (H0)              -1523.902
##   Loglikelihood unrestricted model (H1)      -1523.902
##
##   Akaike (AIC)                                3053.804
##   Bayesian (BIC)                              3072.193
##   Sample-size adjusted Bayesian (SABIC)       3062.661
##
## Root Mean Square Error of Approximation:
##
##   RMSEA                                          0.000
##   90 Percent confidence interval - lower         0.000
##   90 Percent confidence interval - upper         0.000
##   P-value H_0: RMSEA <= 0.050                       NA
##   P-value H_0: RMSEA >= 0.080                       NA
##
## Standardized Root Mean Square Residual:
##
##   SRMR                                           0.000
##
## Parameter Estimates:
##
##   Standard errors                             Standard
##   Information                                 Expected
##   Information saturated (h1) model          Structured
##
## Regressions:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  St
d.all
##   ofte_s ~
##     crgvr_c_   (c)   -0.051    0.008   -6.278    0.000   -0.051   -
0.107
##     ofte_s_p (cov)    0.027    0.006    4.743    0.000    0.027
0.081
```

```
##
## Variances:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  St
d.all
##    .ofte_s            0.144    0.003   41.195    0.000    0.144
0.981
##
## Defined Parameters:
##                    Estimate  Std.Err  z-value  P(>|z|)   Std.lv  St
d.all
##     direct           -0.051    0.008   -6.278    0.000   -0.051   -
0.107
```

```
# Obtain parameter estimates with confidence intervals
estimates <- parameterEstimates(fit, boot.ci.type = "bca")

# Print the parameter estimates with confidence intervals
print(estimates)
```

```
##                            lhs op                          rhs  lab
el    est
## 1                     ofte_s  ~ caregiver_child_relationship
c -0.051
## 2                     ofte_s  ~                    ofte_s_p    c
ov  0.027
## 3                     ofte_s ~~                      ofte_s
0.144
## 4 caregiver_child_relationship ~~ caregiver_child_relationship
0.655
## 5 caregiver_child_relationship ~~                    ofte_s_p
-0.048
## 6                   ofte_s_p ~~                    ofte_s_p
1.323
## 7                     direct :=                          c dire
ct -0.051
##      se      z pvalue ci.lower ci.upper
## 1 0.008 -6.278      0   -0.066   -0.035
## 2 0.006  4.743      0    0.016    0.038
## 3 0.003 41.195      0    0.137    0.151
## 4 0.000     NA     NA    0.655    0.655
## 5 0.000     NA     NA   -0.048   -0.048
## 6 0.000     NA     NA    1.323    1.323
## 7 0.008 -6.278      0   -0.066   -0.035
```

Syntax

```
> mediation <- '
+ ofte_s ~ b1*close_f + b2*close_m
+ ofte_s ~~ c*ofte_s_p
+ '
> fit <- sem(mediation, data = Ola_Dataset)
> if(!requireNamespace("semPlot", quietly = TRUE)) install.packages("semPlot")
> library(semPlot)
> semPaths(fit, whatLabels="est", layout="tree", edge.label.cex = 1.2)
> summary(fit)
lavaan 0.6.17 ended normally after 18 iterations

  Estimator                                         ML
  Optimization method                           NLMINB
  Number of model parameters                         5

                                                  Used       Total
  Number of observations

                                                  2845        4898


Model Test User Model:
  Test statistic                                19.076
  Degrees of freedom                                2
  P-value (Chi-square)                          0.000

Parameter Estimates:

  Standard errors                             Standard
  Information                                 Expected
  Information saturated (h1) model          Structured

Regressions:
                   Estimate  Std.Err  z-value  P(>|z|)
```

ofte_s ~				
close_f (b1)	-0.017	0.006	-2.831	0.005
close_m (b2)	-0.039	0.008	-4.862	0.000

Covariances:

	Estimate	Std.Err	z-value	P(>|z|)
.ofte_s ~~				
ofte_s_p (c)	0.033	0.008	4.225	0.000

Variances:

	Estimate	Std.Err	z-value	P(>|z|)
.ofte_s	0.137	0.004	37.716	0.000
ofte_s_p	1.280	0.034	37.716	0.000

```
library(lavaan)
> model <- '
+   ofte_s ~ b1*comm_f + b2*comm_m
+ '
> fit4 <- sem(model4, data = Ola_Dataset, se = "bootstrap", bootstrap = 1000)
> summary(fit4)
lavaan 0.6.17 ended normally after 1 iteration
```

Estimator	ML	
Optimization method	NLMINB	
Number of model parameters	3	
	Used	Total
Number of observations	2382	4898

Model Test User Model:

Test statistic	0.000
Degrees of freedom	0

Parameter Estimates:

Standard errors	Bootstrap
Number of requested bootstrap draws	1000
Number of successful bootstrap draws	1000

Regressions:

		Estimate	Std.Err	z-value	P(>|z|)
ofte_s ~					
comm_f	(b1)	-0.015	0.008	-1.860	0.063
comm_m	(b2)	-0.026	0.010	-2.565	0.010

Variances:

	Estimate	Std.Err	z-value	P(>|z|)
.ofte_s	0.131	0.019	7.043	0.000

> parameterestimates(fit4)

	lhs	op	rhs	label	est	se	z	pvalue	ci.lower	ci.upper
1	ofte_s	~	comm_f	b1	-0.015	0.008	-1.860	0.063	-0.032	0.002
2	ofte_s	~	comm_m	b2	-0.026	0.010	-2.565	0.010	-0.047	-0.008
3	ofte_s	~~	ofte_s		0.131	0.019	7.043	0.000	0.095	0.165
4	comm_f	~~	comm_f		1.229	0.000	NA	NA	1.229	1.229
5	comm_f	~~	comm_m		0.152	0.000	NA	NA	0.152	0.152
6	comm_m	~~	comm_m		0.791	0.000	NA	NA	0.791	0.791

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