POSTPARTUM DEPRESSIVE SYMPTOMS AMONG UNMARRIED, BLACK FATHERS: THE ROLE OF SOCIAL NETWORK CHARACTERISTICS AND CONTEXTUAL FACTORS

by

CLARE R. THOMAS

(Under the Direction of Geoffrey L. Brown)

ABSTRACT

Identifying risk factors for postpartum depressive symptoms (PPD) in new fathers is critical for supporting the health and well-being of families. Nonetheless, extant research has neglected the unique experiences of Black fathers in the United States, who may be at an increased risk of developing paternal PPD symptoms. Informed by ecological systems theory, the proposed study examined the links between contextual risk factors (negative life events, inter-parental relationship quality, infant temperamental difficulty, and experiences with racism) and unmarried, Black fathers' PPD symptoms, as well as the protective effects of structural social network characteristics. Network characteristics of density and transitivity describe the extent to which individuals and groups within a social network are connected to one another. The inclusion of structural network characteristics represents a novel contribution to the literature on predictors of paternal PPD. We hypothesized that a) more negative life events, poorer relationship quality, greater infant temperamental difficulty, and more experiences with racism would be associated with more paternal PPD symptoms, b) higher social network density and transitivity would be associated with fewer paternal PPD symptoms, and c) the associations between contextual risk factors and PPD symptoms would be attenuated when density and

transitivity were high. A sample of 181 unmarried, Black fathers in rural Georgia with 3-6-month-old infants reported on depressive symptoms, negative life events, inter-parental relationship quality, temperamental difficulty, and experiences with racism. Social network interviews were conducted to assess connections between social network members. Results generally supported proposed hypotheses. Specifically, in main effects models more negative life events and lower quality inter-parental relationships significantly predicted more paternal PPD symptoms. Contrary to expectations, higher levels of temperamental difficulty predicted fewer PPD symptoms. Both density and transitivity in social networks predicted fewer PPD symptoms over and above the effect of other contextual risk factors. Some hypothesized moderating effects were supported. Poor relationship quality was not associated with more depressive symptoms when transitivity was high. And temperamental difficulty was associated with fewer depressive symptoms when both density and transitivity were high. Findings speak to the protective effects of social network connections for the mental health of unmarried, Black fathers.

INDEX WORDS: fathers, postpartum depression, social networks, negative life events, inter-parental relationship quality, infant temperament

POSTPARTUM DEPRESSIVE SYMPTOMS AMONG UNMARRIED, BLACK FATHERS: THE ROLE OF SOCIAL NETWORK CHARACTERISTICS AND CONTEXTUAL FACTORS

by

CLARE R. THOMAS

B.S., Brigham Young University, 2013

M.S., Brigham Young University, 2019

A Dissertation Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment of the Requirements for the Degree

DOCTOR OF PHILOSOPHY

ATHENS, GEORGIA

2024

POSTPARTUM DEPRESSIVE SYMPTOMS AMONG UNMARRIED, BLACK FATHERS: THE ROLE OF SOCIAL NETWORK CHARACTERISTICS AND CONTEXTUAL FACTORS

by

CLARE R THOMAS

Major Professor:	Geoffrey L. Brown
Committee:	Assaf Oshri
	Steve Kogan

Electronic Version Approved:

Ron Walcott

Dean of the Graduate School

The University of Georgia

August 2024

DEDICATION

To my husband Andrew, who has stood by me through all the chaos. And to our son, Curtis, who firmly believes all mom's get their PhD's and has loved me in spite of my shortcomings throughout this journey. I love you both. And to all my friends and family who have acted as our little community in many times of need. I could not have done this without you.

ACKNOWLEDGEMENTS

A very special acknowledgement to my advisor, mentor, and chair of this dissertation Dr. Geoffrey L. Brown. I came to Georgia because I knew I wanted to work with you more than any other professional studying fathering. I have never once regretted that decision. You have led me, pushed me when needed, calmed my nerves, validated my experiences, and been with me through thick and thin. I could never have gotten this far without you. Words cannot begin to express my immense gratitude for all you have done for me. I would also to acknowledge the other members of my committee, Dr. Steven Kogan and Dr. Assaf Oshri. Your support and belief in me (even when I didn't believe in myself) has been invaluable. Finally, I would like to acknowledge Dr. Erin Holmes, who saw something in me and took a chance on me so many years ago. You changed my life. Thank you.

TABLE OF CONTENTS

Page

LIST OF TABLES

Page

LIST OF FIGURES

Page

CHAPTER 1

INTRODUCTION

After the birth of a child, fathers are at risk for developing symptoms of postpartum depression (PPD), with the negative effects of PPD symptoms being long-term and far-reaching for themselves and their families. According to a meta-analysis examining publications from 1984 to 2015, incidence of clinical diagnoses of paternal PPD in the U.S. is between 8-10% (Cameron et al., 2016; Paulson & Bazemore, 2010; Scarff, 2019), though estimates in some populations can range to over 25% (Goodman, 2004). However, these estimates do not account for the many fathers who are undiagnosed and untreated, nor for the many fathers who may not be clinically depressed but still experience sub-clinical levels of depressive symptoms. In the present study, we conceptualize paternal PPD as consisting of symptoms of depression that can emerge in the prenatal or early postnatal period and persist across the first year of the child's life (see Paulson et al., 2016).

Paternal PPD has negative consequences across the life course for men's mental and physical health, including increased likelihood of depression beyond the postnatal period and elevated rates of drug and alcohol abuse (Philpot, 2016). Moreover, paternal PPD can have a strong impact not only on the fathers, but also the health of the entire family (Goodman, 2004; Kim & Swain, 2007). Given that fathers' contributions to their families are greatly affected by their own mental health, the negative consequences of paternal PPD symptoms can extend to other family members (Palkovitz, 2019). Paternal mental health is a prerequisite for healthy interactions with one's family and can impact the entire family system, including their partner and child (Cabrera et al., 2018).

In particular, paternal PPD symptoms appear to place children at risk for numerous deleterious developmental outcomes. For example, in a global meta-analysis performed on 28 studies, Gentile and Fusco (2017) found that paternal PPD was associated with increased developmental delays (i.e. high levels of impairment) and behavioral problems (i.e. crying, hyperactivity) in their children, as well as an increased likelihood that their child would later be diagnosed with a psychiatric disorder. Sweeney and MacBeth (2016) found similar results in their systemic review, such that paternal PPD was associated with multiple aspects of children's socioemotional problems. Thus, understanding how to reduce and treat paternal PPD is important for promoting the health of new fathers, but also has downstream consequences for healthy development in the next generation. More research on the correlates of paternal PPD (both risk and protective factors) is critical for the development of effective and targeted interventions that support new parents and their children.

Postpartum Depressive Symptoms Among Unmarried, Black Fathers

The addition of heightened stress and family responsibilities (Kim & Swain, 2007) as well as hormonal changes (Field, 2018) that occur during the preparation and welcoming of a new child can create risk for depressive symptoms during the postpartum period among all parents (Ansari et al., 2021). The vast majority of research on PPD has occurred with mothers, married couples, and racial majority samples (Kim & Swain, 2007). In the United States, the experiences of unmarried, Black fathers are distinct from other parents and have been largely overlooked in the extant empirical literature on PPD. For many Black Americans, the likelihood of developing depressive symptoms is amplified compared to other socio-demographic groups because of historically racist systems and structures, as well as overt experiences with racism and discrimination (Hill, 2001; Plowden et al., 2016).

Although research regarding Black fathers and PPD symptoms is limited, Black men in general are less likely to be diagnosed or treated for symptoms of depression compared to their White counterparts (Anderson et al., 2005; Sinkewicz & Lee, 2010). Further, Black men's experiences with discrimination and racism can affect mental health directly, often resulting in Black fathers being at an elevated risk for undiagnosed and untreated symptoms of PPD. For instance, Bamishigbin et al. (2017) found that Black fathers who experienced high rates of individual racism were more likely to have high rates of PPD symptoms up to a year after the birth of their child.

The potential risks for Black men are compounded when help-seeking behaviors and resources are considered. Black men are less likely to seek or receive professional help for their mental health due to historically racist medical practices (Bailey et al., 2021), current mistreatment in the medical field and distrust in medical providers (Bailey et al., 2017), as well as a lack of guidance on how to navigate mental healthcare systems and resources (Coleman-Kirumba et al., 2023). For Black fathers who are already at risk for depressive symptoms, this lack of access to support structures can make it increasingly difficult for fathers with PPD symptoms to be properly identified and receive necessary mental health care. Given the confluence of circumstances that place Black men at particular risk for PPD and its attendant consequences, the need to understand both risk and protective factors for PPD in this population is especially consequential.

The present study was intended to meet this need by examining predictors of paternal PPD that include a series of contextual risk factors and structural social network characteristics among unmarried, Black fathers with a new baby. Specifically, the current study will test the following hypotheses: a) higher levels of negative life events, temperamental difficulty, and experiences with racism, and lower levels of inter-parental relationship quality will be associated

with more postpartum paternal depressive symptoms, b) protective social network characteristics including greater density and transitivity will be associated with fewer depressive symptoms, and c) density and transitivity will moderate associations between contextual risk factors and paternal PPD by attenuating the association between these risk factors and higher levels of depressive symptoms. Theoretical and methodological considerations informing the present study's hypotheses, design, and selection of study variables are discussed in the sections below.

Bioecological Perspectives on Paternal Postpartum Depressive Symptoms

The present study is informed by ecological perspectives on paternal mental health during the postpartum period. Bronfenbrenner's bioecological theory rests on the assumption that humans are a product of both biology and ecology (Bronfenbrenner, 2001). In addition, most people are dependent on other humans as well as their own environments to have their social, emotional, and psychological needs met (Bronfenbrenner & Morris, 2006). Systems theories, including Bronfenbrenner's bioecological theory, are rooted in the concept that contexts influence individual development, including intrapersonal characteristics and both physical and mental health (Witherington, 2007). According to Bronfenbrenner's theory, contexts at multiple levels are important for understanding human phenomena with biological underpinnings (Bronfenbrenner & Morris, 2006).

The development of postpartum depression involves complex biopsychosocial processes. Pregnant women experience a host of biological changes in the prenatal period that extend into the first year of the child's life, largely mediated through the functioning of multiple neuroendocrine systems, including estradiol, progesterone, oxytocin, and cortisol (Trifu et al., 2019). For some new mothers, these changes can result in attendant hormonal imbalances (Schiller et al., 2015) and dysregulation of the HPA axis (Yim et al., 2015) that place them at elevated risk for developing depressive symptoms in the postnatal period. The psychosocial

stress that often accompanies new parenthood can alter these biological mechanisms further and trigger the onset of symptoms in the early months of a new baby's life.

Emerging evidence suggests that men also experience biological changes during the perinatal period, with the transition to parenthood representing a key inflection point for men's health (Saxbe et al., 2018). Like pregnant mothers, some studies suggest that neuroendocrine functioning changes substantially for fathers before and after the birth of a child. For instance, most men show decreases in oxytocin and increases in testosterone from pre- to post-birth (Gettler et al., 2011; Gordon et al., 2010). Although some of these changes may be evolutionarily adaptive for bonding with one's infant, the interplay between oxytocin, testosterone, and numerous other hormones including vasopressin, estradiol, and cortisol can create imbalances that place new fathers at increased vulnerability for depressive symptoms relative to men at other stages of the lifecourse (Bakermans-Kranennburg et al., 2022). New research suggests that structural brain-related changes including cortical volume reductions from pre- to post-birth in new fathers are also associated with both greater paternal engagement and mental health risk (Saxbe et al., 2024). Although the birth of a child can lead to more health-promoting behaviors (e.g., less risk-taking, reductions in alcohol and substance use) for many men, socially mediated biological changes such as lack of sleep, insufficient exercise, and post-birth weight gain exacerbate risk for depressive symptoms in fathers with a young infant (Torche & Rauff, 2021).

Collectively, biological changes that occur in the prenatal and early postnatal period can create conditions for depression risk in fathers. However, in community populations there is substantial variability in depressive symptoms following the birth of a child. The risk factors that are likely to trigger depressive symptoms in new parents -- as well as the protective factors that support parents in the face of those risks -- are social and contextual in nature and exist across numerous ecological systems (Yim et al., 2015). For fathers residing in stressful socio-contextual

circumstances (i.e., poverty, non-marital births, resource-poor rural communities), the effects of ecological contexts on paternal adjustment may be particularly profound (Gavin et al., 2002).

Ecological models of fatherhood highlight that determinants of fathering exist in social contexts that can dictate the health and well-being of men as parents (Cabrera et al., 2014; Volling & Cabrera, 2019; Palkovitz & Hull, 2018). Collectively, these models make the case that the paternal role is shaped by contextual factors within each of Bronfenbrenner's ecological systems. From an ecological developmental systems perspective, studies examining fathering behavior or father-child relationship quality should incorporate contexts that go beyond the individual and their proximal environments; studies should expand the scope of risk and protective factors for fathers to extrafamilial social relationships, macro-level cultural values and structural characteristics, and interactions among and between systems across time (Parke & Cookston, 2019). According to Cabrera et al. (2014), in her expanded ecological model of fathering, "A father's personal characteristics reflect his biological, cultural, and rearing history. They also reflect his current family context and relationships… his social networks, and community circumstances." Although these conceptual models have been generative for work on the predictors of fathering behavior, ecological systems approaches to understanding paternal PPD have rarely been considered. The present study was designed to fill this gap and will consider risk and protective factors affecting paternal PPD symptoms within multiple ecological systems.

Ecological Contexts of Paternal PPD Risk Factors

Bronfenbrenner's model contains at least four sub-systems: the microsystem (e.g. the immediate environment of a person), mesosystem (e.g. links that exist between two or more microsystems), exosystem (e.g. settings or institutions), and macrosystem (e.g. customs, culture, ideologies, values, laws). The chronosystem (e.g. historical events according to age or cohort)

was added later as a contribution of the Process-Person-Context-Time Model (PPCT), which adds to Bronfenbrenner's original model by including time, genetics, and patterns of interaction that facilitate development (Bronfenbrenner & Morris, 2006). According to the person-centered approach of bioecological theory, depression in an individual can develop through factors within themselves as well as through their environment. For fathers, their experience of PPD can both influence and be influenced by their environments.

The majority of studies that have considered inter-personal predictors of paternal PPD have focused exclusively on influences at the level of the microsystem. Within the microsystem, the quality of the parents' relationship is a particularly consistent predictor of symptoms of depression. Chhabra et al. (2020) performed a meta-analysis focused on paternal depression using 45 studies published worldwide between 1950 and 2017; they found that marital distress more than doubled the likelihood of fathers being diagnosed with depression (Chhabra et al., 2020). Child effects on parents are another aspect of the microsystem that can affect paternal PPD. Evidence suggests that children who are more temperamentally challenging may elicit parenting stress, subsequently placing fathers at risk for postpartum depressive symptoms (deMontigny et al., 2013; Eddy et al., 2019; Frost, 1996).

The macrosystem is a broader system less close to the individual that encapsulates values, customs, and ideologies that can directly or indirectly impact the individual person. Common factors within the macrosystem, such as financial instability (Watkins, 2012), unemployment (Ward & Mengesha, 2013), and lack of formal education (Bradley & Slade, 2011) are associated with paternal depressive symptoms. In this study we also consider negative life events that capture aspects of the microsystem (e.g., relationship break-up, death of a loved one, job loss, etc.) as well as the broader macrosystem, such as structural and systemic racism. Macrosystem level influences on unmarried, Black fathers might consist of interactions with the criminal

justice system -- both as suspects and victims of crime -- as well as interactions with healthcare systems due to illness and injuries. In both cases, the negative effects of these experiences may be particularly impactful on the mental health of Black men given the legacy of historical racism in the United States that affects both systems, creating disparities that disproportionately affect Black men (Bailey et al., 2017; Coleman-Kirumba et al., 2023; Williams & Perry, 2019). Moreover, socio-historical forces in this country have created an environment in which Black men regularly experience individual instances of racial discrimination. These day-to-day experiences of racism can take their toll to create race-related stress, racial trauma, and ultimately maladaptive mental health outcomes (Ward & Mengesha, 2013; Watkins et al., 2006).

The chronosystem adds a key element of Bronfenbrenner's bioecological theory by including time and cohort. Expectations for fathers have changed substantially over the last several decades (Levant & Wimer, 2009). Modern fathers are expected to be more involved in their child's daily life, more involved in household chores, and more affectionate and nurturing than in past years (Hunter et al., 2017; Latshaw & Hale, 2015; Rochlen et al., 2008). These new expectations for parenting roles could add pressure to fathers who may already be susceptible to challenges associated with the transition to parenthood, thereby increasing risk for developing symptoms of depression.

However, public discourse regarding men's mental health has also evolved substantially across the last several generations. With social media outlets increasing mental health awareness and symptoms of depression becoming more acceptable for men to acknowledge (Tully et al., 2018; Ulvi et al., 2022), current historical timing could both lead to increased symptoms of paternal depression as well as increased resources for treating and resolving those symptoms relative to prior generations. As such, the exploration of risk and protective factors for depressive symptoms in this population of new fathers is particularly timely.

Protective Social Networks as an Ecological Context

Among Bronfenbrenner's proposed systems, the mesosystem has received particularly scant attention as it relates to the development of paternal PPD. Historically, mesosystem influences on individuals have been challenging to operationalize, with measurement and analytical approaches for understanding mesosystem influences lacking (McIntosh et al., 2008). Biopsychosocial models of depressive symptoms, however, highlight the potentially important role of social networks beyond the immediate family for supporting individuals at risk for depressive symptoms. The protective role of social support has long been considered in the depression literature (Perkins et al., 2015; Reid & Taylor, 2015; Rosenquist et al., 2011). Nonetheless, these studies have often considered only the ways in which social relationship quantity (e.g., number of people in one's social network) or quality (e.g., friendship quality) affect fathers via direct interactions with network members.

Conceptualizations of postpartum depression from an ecological systems lens instead emphasizes the role of connections *between social network members* to support new parents facing contextual stress. Social networks that are tightly connected – including close relationships among network members (i.e., network density) and multiple sub-groups within networks (i.e., transitivity) – may support parents by facilitating the flow of information within their network. Parents often face substantial barriers to receiving necessary support in the postnatal period. These barriers are amplified among unmarried, Black fathers who are often marginalized from the pregnancy and childbirth process (Gavin et al., 2002). Strategies for surmounting these challenges must often rely on ecological contexts and social networks to support the help-seeking that is necessary for many new parents (Place et al., 2024). Conceptually, connections and relationships between members of a social network would allow for better communication and coordination of help and care for new parents. As such, structural

aspects of social networks provide an ideal test case for considering the role of ecological contexts in general -- and mesosystem effects in particular -- on individual adjustment following the birth of a baby.

Summary and Significance of the Study

This study adopts an ecological systems approach to consider multiple contextual risk factors that may affect paternal PPD among unmarried, Black fathers. Further, the main and moderating effects of social network structures (i.e., density and transitivity) on paternal PPD will be examined to test the hypothesis that more tightly connected individuals and groups in a network may contribute to the mental health of unmarried, Black men with a new baby.

Despite the public health burden of paternal PPD, little is known about the correlates of paternal depressive symptoms in the postpartum period. Although structural factors place them at potentially increased risk relative to other groups, even less is known about the predictors of PPD for unmarried, Black fathers. Understanding the personal, relational, and contextual factors that impact the development of depressive symptoms is important for learning how to best meet the needs of these new fathers (Cameron et al., 2016; Fisher et al., 2021). Elucidating the determinants of paternal postpartum depressive symptoms, as well as potential protective factors that might disrupt pathways to PPD, can aid in the creation of practices, programs, and policies that support paternal mental health during early infancy. Thus, this work can inform efforts to promote men’s health and maximize unmarried, Black fathers' contributions to their families and young children (Fletcher et al., 2011).

CHAPTER 2

CONCEPTUALIZING AND MEASURING SOCIAL NETWORK STRUCTURES

To explicate the mechanisms by which social networks may affect paternal PPD symptoms, it is necessary to briefly introduce some conceptual and methodological issues that informed the present study's approach to social network analysis. This chapter serves as a short primer on social network analysis, with a particular focus on concepts and decisions relevant to the goals of this study. In particular, the rationale guiding the development of the social network interview and selection of relevant social network variables included in study hypotheses and analyses (i.e., density and transitivity) are discussed.

Social networks are built through the development of social relationships across the lifecourse, and can serve as a major source of support, particularly during developmental periods (such as the birth of a new child) that can be stressful or require substantial adjustments to routines, relationships, and life circumstances (Rhode et al., 2018). According to Borgatti et al. (2022), "Networks are a way of thinking about social systems that focuses our attention on the relationships among the entities that make up the system" (Borgatti et al., 2022, pp. 2). Social network analysis is unique relative to many other approaches in developmental and family science, as the principle goal is often to characterize the social structure of the network as a whole (i.e., relations among multiple network members or groups) rather than describe attributes of the individual or their own relationships (Marin & Wellman, 2011). Understanding the structural characteristics of social networks can be useful for elucidating the ways in which families, friends, and other social support groups can collectively impact parents across the transition to a new baby.

Social networks can include personal, professional, or casual relationships. Given the present study's interest in the development of mental health for new parents, the focus of the social network interview was on personal relationships, which most commonly includes family members and close friends, but may also encompass relationships with others including neighbors, co-workers, or service providers. The developmental science literature has long examined the role of social support in promoting parental well-being, positive parenting practices, and child development (Armstrong et al., 2005; Crittenden, 1985; Green et al., 2007). However, associations between structural characteristics of these social support networks and positive adjustment for families, parents, or children are rarely considered. According to Scott (2012), social networks contain an interdependence of social influence, and the structure of these networks "can shape the flow of information and resources" (Scott, 2012, pp. 57). We posit that social network structures that facilitate this flow of information and resources will be especially vital for unmarried, Black fathers at risk of developing symptoms of paternal PPD.

Variables Characterizing Social Network Structures

Although many methods exist for collecting and analyzing social network data, for the purposes of this study an ego-network method was employed. Each individual network consists of multiple individuals (i.e. nodes) who are elicited from a single person, also known as an "ego" (Kennedy et al., 2015). The reliance on egos to provide information on social network members as well as the relationship between members of their social network provides a relatively efficient option for characterizing structural aspects of this network. Although ego-network analysis is relatively new to social network analyses, the capacity to examine connections within ego-networks provides nuanced information about social networks and offers a strong alternative to traditional forms of social network analysis (Tabassum et al., 2018).

Within an ego-network design, there is a tendency for hierarchical “circles” of closeness or association to develop, with closest relationships being in the “inner circle” of the ego and decreases in closeness creating subsequent outer circles around the ego (Dunbar, 1998; Hill & Dunbar, 2003). Those in the “inner circle” would be considered close family members or friends, with those in the furthest of “outer circles” being acquaintances (Sutcliffe et al., 2012). However, approaches to studying social support that focus exclusively on relationships of network members to the ego provide only limited information on the network as a whole. The primary advantage of the ego-network approach is the ability to measure connections of network members (regardless of their closeness to the ego) with one another.

Social networks are graphed according to vertices (i.e. individuals in the network) and edges (i.e., lines connecting two vertices). Edges represent the relationship between two points or relationships and are defined according to the endpoints of the vertices (Tabassum et al., 2018). They create a sociomatrix, meaning that the rows and columns of any matrix are always equal to one another, creating square-shaped matrices. The ego is considered a fixed point, whereas all other structural characteristics are changeable. Thus, the ego is not the unit of analysis, but rather the dyadic relationships and associations among network members are considered the unit of analysis (Wasserman & Faust, 1994). Because the ego is not the unit of analysis, it is removed from all ego-network analyses in order to examine the network without the influence of the ego connecting the members of the network (Kennedy et al., 2015; Scott, 2012). This changes the focus to examine the social resources available to the individual, rather than the individual themselves. Because of the focus on structural characteristics of the social network in the current study, levels of homophily (how similar alters are to the ego) or homogeneity (how similar alters are to each other) will not be examined, as these measures require more in-depth qualitative examination of the individuals within a network (McPherson et al., 2001).

The structure of a social network is comprised of many factors, including not just the number of people in a network (alters), but also how close they are to one another and to the focal person (ego), as well as the constellation and configuration of various groups within the social network. According to Heider's theory of balance, networks form through an individual's motivation to "establish and maintain balance in their relationships" (Krackhardt & Handcock, 2018, pp.1). Thus, for many ego-networks, people are connected through their shared experiences. The balance in relationships is measured and maintained through multiple structural social network characteristics. According to seminal work by Wasserman & Faust (1994), some important structural aspects of networks include how well each member of the network knows one another (i.e. density), and how many smaller groups form within a social network (i.e. transitivity).

Structural network characteristics can often fit into one of two categories: either the structural impact of one individual person on the overall network, or an assessment of the network as a whole (Wasserman & Faust, 1994). Measures of centrality are designed to capture the former. Centrality measures are intended to assess the impact of a single node on the overall network. For instance, one might wish to consider the centrality of the child's mother within a father's social network. Ways to measure centrality include degree centrality, betweenness centrality, and eigenvector centrality (Tabassum et al., 2018). All measures of centrality indicate whether or not there is an individual, known as a central actor, with high power within the network. These central actors hold power and control of the flow of information from one individual or group in a network to the others within the network (Scott, 2012). Degree centrality is the measurement of a central actor on all other members of the network, and is measured according to the number of lines, or edges, connecting a single node to all other members. Betweenness centrality is computed according to the percentage of shortest paths, or how quickly

the lines or edges can be followed to reach a central actor. The concept of bridge connection is common in this analysis; bridge connection specifies the extent to which an individual gains connection to other individuals or groups through other people, referred to as "bridges" within the social network. Eigenvector centrality assumes that an individual's power within a network is determined by the other members of the network. It is calculated using an adjacency matrix to examine the frequency of connections to one individual. It is similar to degree centrality, though considered to be a more elaborate test of the power of a central actor to connect others within a social network (see Tabassum et al., 2018 for more details regarding calculations and equations).

Overall, measures of centrality within social network analysis describe the extent to which individual members of a network are only brought together by one central person. One example might be having friends from various times and settings in your life that do not know each other and are only connected through a single individual. This person would be considered crucial for the functioning and flow of the network as a whole, taking a place of prominence and importance in the network structure, which could be entirely disconnected without them (Wasserman & Faust, 1994). Similarly, betweenness centrality occurs when a single person connects other *groups* in the network but is not a part of these groups and the groups are isolated from one another. This person acts as an intermediary between different points in the network and as such can play a role in controlling the flow of information from one group in a network to another group within that network (Scott, 2012, pp. 42).

In addition, structural equivalence (i.e. when two nodes are completely interchangeable without changing the structure of the network), and regular equivalence (when two nodes are not interchangeable) are also both assessments of the individual node on the overall network. Within social network analysis, equivalence is considered a classification system that helps define the

ties between individuals in the network, both as the actors within a network and the relation actors have to one another in the network (Wasserman & Faust, 1994).

All measures of centrality and equivalence focus on the degree to which one network member connects other members or groups (Scott, 2017, pp. 99), which can be useful for testing hypotheses involving a single key actor in the network. For example, certain research questions may be concerned with elucidating the role of one individual (e.g., parent, partner, or best friend) within a broader social network. And for some outcomes the degree to which social capital is accessed via a single node may be especially important. However, the present study is concerned with the provision of social support for paternal postpartum depression, a time during which many new parents receive support from multiple network members. Further, the target population of unmarried, Black fathers is often reliant on networks that are both vast and often closely connected. As such, the goal of this work was to characterize not just the structural impact of one individual within a network, but the holistic structure of social network connections. Thus, we focus specifically on two structural network characteristics designed to serve this purpose: network density and transitivity.

Density

The density within an ego-network calculates the number of edges within the overall network structure in order to determine how close the network is as a whole. This is calculated according to the lines linking members of the network relative to the total possible number of ties that could exist (Jackson et al., 2014). The density of a network is often considered the key network variable that dictates the flow of information within that network, such that highly dense networks have greater flow of information (Kennedy et al., 2015). Most ego-network have some level of redundancy (i.e. multiple paths existing between nodes; Tabassum et al., 2018). The effect size of ego-networks are largely dependent on density, such that highly dense networks

have an effect size that remains constant while networks with low density have an effect size that increases with the number of alters (Tabassum et al., 2018).

Functionally, measures of network density assess how closely or loosely individual network members are connected to one another. Network ties can be defined in different ways, as a function of how "edges" between nodes are set. In this study, given the expectation of close connections within social networks and the importance of relying on close relationships to provide support for PPD symptoms, the edge of how well network members know each other "very well" was used. We hypothesize that this measure of network density may play a key role in protecting unmarried, Black fathers from contextual risk for paternal PPD symptoms.

Transitivity

Transitivity measures the number of smaller groups that form within a network. These smaller groups consist of three or more individuals that are connected to one another. This formation changes the focus of analysis from dyadic to triadic in order to characterize the functioning of groups (rather than individual relationships) in a social network. These triadic formations rely on relationship reciprocity and hold the assumption that "a friend of a friend is a friend" (Wasserman & Faust, 1994). In other words, high levels of transitivity are present when all three members of the triad hold an equal relationship status with the other members of the triad (Tabassum et al., 2018). For example, when high transitivity is present in a network, the triad of friendships is a complete loop and every member agrees that they know one another equally well. These type of Simellian ties are considered "sticky" ties, in that they will likely last longer, with the expectation that these groups will stay connected at subsequent measurement timepoints (Krackhardt, 1998). In this regard, transitivity can be considered a robust (and often lasting) indicator of the cohesion of groups within a social network.

Transitivity is calculated using a global clustering coefficient that is computed for the network as a whole rather than for each individual node (Tabassum et al., 2018). This is done by comparing the square of the sociomatrix with the sociomatrix to examine if ties in the original sociometrix are found to be a subset in the squared sociomatrix (Wasserman & Faust). The balance within a social network occurs when all members of smaller groups know one another equally well; according to this definition of balance, high levels of transitivity are considered an essential measure of balance in a network as well as a key measure of connectedness among small groups within the network (Krackhardt & Handcock, 2018). Like density, transitivity is thought to facilitate the flow of information through networks, while also specifying the degree of cohesion and balance in a network. Given the expectation that unmarried, Black fathers will rely heavily on a range of network members and groups for support, transitivity was also hypothesized as a protective factor in the present study.

Summary

The nascent body of research regarding social networks during the postpartum period has not considered the structural webbing of social networks. For example, Rhode et al.'s (2018) work on the social networks of mothers before and after the birth of their child only examined a single aspect of the network structure: the number of persons listed in a network. However, this approach provides no information on the connections between network members, including whether the members of the networks knew each other, whether they were considered close, or if there were multiple friend groups within the network. As such, existing evidence does not account for the holistic impact of social network structures on paternal symptoms of depression during the postpartum period. In particular, the social network variables of density and transitivity provide an opportunity to examine the impact of social network structure on paternal PPD symptoms. Measuring both network density and transitivity allows for the identification of

patterns of social connection among friends and family, and the effects of these patterns on the individual whose network is being examined (Wasserman & Faust, 1994).

CHAPTER 3

LITERATURE REVIEW

Despite the joys and benefits that can come with the birth of a new child, many parents experience this transition as a stressful and emotionally challenging time (Genesoni & Tallandini, 2009). Consequently, a substantial portion of new mothers and fathers exhibit symptoms of PPD, with long-term negative consequences for parental mental health (Goodman, 2004), father-mother and father-child relationship functioning (Chhabra et al., 2020; Heshmati et al., 2023), and child development (Ashraf et al., 2023; Field, 2010; Gentile & Fusco, 2017). Depressive symptoms for new parents often begin prenatally and persist during the early postpartum period over the first year of the child's life (Grigoriadis et al., 2019; Kingston et al., 2012). Although maternal PPD has received substantial attention in the extant literature, relatively fewer studies have examined predictors of paternal PPD, particularly among minoritized and socioeconomically disadvantaged populations in the United States (Kim & Swain, 2007).

For unmarried, Black parents in the rural South, the stress associated with the addition of a new baby may be further amplified due to the combined effects of poverty, individual and structural racism, and residing in low-resource communities (Thomas et al., 2023; Watkins et al., 2006). As a result, Black parents on average report higher levels of depressive symptoms compared to their White counterparts (Orr et al., 2006; Ward & Mengesha, 2013). Moreover, Black men in particular are less likely to receive proper diagnoses or to have access to adequate mental health services (Jung et al., 2014; Plowden et al., 2016), which can result in persistent, untreated symptoms of depression. Thus, identifying the socio-contextual factors that are

associated with depressive symptoms during the postpartum period in this population of parents remains an important public health issue, and a necessary first step for identifying potential points of intervention to support new fathers in this context.

Many different predictors have been linked to PPD symptoms in fathers, including personal factors (e.g., stress, negative life experiences, prior mental health history; Ansari et al., 2021; Wang et al., 2021), inter-parental relationship factors (e.g., relationship satisfaction, coparenting quality, partner history of depression; Chhabra et al., 2020; Field, 2018), and infant factors (e.g., child temperament, sleep, experiences with childbirth and delivery; deMontigny et al., 2013; Frost, 1996; Paulson et al., 2006). However, these variables have been studied almost exclusively in convenience samples across global populations, with very little work considering Black American fathers or those that are not yet married to the child's mother (Ward & Mengesha, 2013). One goal of the present study is to consider the independent and cumulative effect of common risk factors for paternal PPD identified in global systematic reviews and meta-analyses (i.e., negative life events, inter-parental relationship quality, and child temperamental difficulty) in this under-represented sample of fathers. Further, given substantial literature connecting individual experiences with racism to depressive symptoms in Black men (Bamishigbin et al., 2017; Ward & Mengesha, 2013; Watkins et al., 2006), we will consider experiences with racism as an additional potential risk factor of paternal PPD.

Prior studies suggest that *social networks* can help to facilitate healthy adjustment before and after the birth of a new child (Burchinal et al., 1996; Taylor, 2015). Positive social network characteristics, such as trustworthiness and having needs met, have been linked to the provision of support for childbirth preparation (Bäckström et al., 2021), and potentially protective effects against symptoms of depression (Rosenquiest et al., 2011). For unmarried, Black parents, social networks are thought to play an especially important role in providing sources of support for new

parents, particularly among couples who may not yet be in long-term, committed couple relationships or do not have access to adequate resources for prenatal and postpartum care (Jackson et al., 2014; Kim & McKenry, 1998).

Extant research on the role of social support across the transition to a new child has largely considered only parents' own proximal support networks (i.e., who is in your network?), despite recent evidence that *structural network characteristics* (i.e., how are the individuals in your network connected to each other?) may be uniquely important for parents in general and Black parents in particular (Jackson et al., 2014). To date, the nascent body of research in this domain has not examined the role of structural network characteristics as a potential protective factor for symptoms of PPD in this population. The present study seeks to extend prior work on both postpartum depressive symptoms and social support by examining the extent to which structural social network characteristics are associated with PPD symptoms – both directly and in interaction with contextual risk factors – for unmarried, Black fathers in resource-poor communities. In sum, we will examine a) associations between paternal PPD symptoms and contextual risk factors that include negative life experiences, inter-parental relationship quality, infant temperamental difficulty, and experiences with racism, b) the unique contributions of structural network characteristics (i.e., density and transitivity) to variability in paternal PPD symptoms over and above contextual risk factors, and c) whether structural social network characteristics moderate the link between contextual risk factors and paternal PPD among unmarried, Black fathers with a new infant.

Contextual Risk Factors for Postpartum Depression

Given the varied nature of postpartum depression, several different categories of predictor variables will be examined. Belsky's (1984) model of the determinants of parenting can serve as a useful classification system for categorizing these predictors. Specifically, Belsky

proposed that determinants of parenting could be grouped into personal psychological resources, socio-contextual factors, and child characteristics. Similarly, research on PPD has identified individual (psychological and biological), social/relational (predominantly aspects of the inter-parental relationship), and child factors (temperament, gender) as potentially important sequelae of PPD (Ansari et al., 2021; Kim & Swain, 2007; Wang et al., 2021). Although Belsky's work was focused on determinants of parenting rather than symptoms of PPD, we use this framing to discuss evidence of individual (negative life events), relational (inter-parental relationship quality), and child factors (temperamental difficulty) in the extant literature.

Negative Life Events

The birth of a child can be a transitory experience filled with changes in responsibilities, expectations, and schedule disruptions. Each of these can lead to susceptibility to increased life stress among new parents. For many individuals, additional stressful life experiences beyond the birth of a new child may further contribute to vulnerability for PPD. *Negative life events* are conceptualized as acute and contemporaneous (i.e., relatively recent) stressful experiences, as distinct from chronic stressors or other adverse experiences that may have occurred at early points in development (i.e., child maltreatment). Negative life events can be varied, including unwanted changes in employment or financial well-being, involvement with law enforcement or being a victim of a crime, dissolution of close relationships, serious illnesses/injuries/accidents, and deaths of close loved ones or other traumatic experiences (Kowal et al., 2007). These types of stressful life events have been causally linked to a greater likelihood of developing depression (Assari & Lankarani, 2016), such that men are up to 5 times more likely to be diagnosed with major depressive disorder if they have experienced a negative life event in the prior several months (Kendler et al., 1999).

As multiple events accumulate – particularly in the context of the everyday challenges of parenting an infant – even life experiences that are transient and mild can take a toll on the mental health of some new parents. Empirical support comes from studies documenting links between the number of stressful life events experienced and reported levels of depressive symptoms (Julian et al., 2021). According to one study of over 1,000 Norwegian families, the number of stressful life events predicted the development of depressive symptoms in both mothers and fathers of young children (Flouri et al., 2018). However, the impact of negative life events is not limited to clinical depression, with multiple studies documenting associations between negative life events (e.g., romantic relationship break-ups, deaths of family members) and higher levels of sub-clinical depressive symptoms (Keller et al., 2007; Visser et al., 2013).

Despite largely focusing on mothers, there is some emergent research implicating negative life events as a risk factor for postpartum depressive symptoms in fathers as well. For example, in their meta-analysis on paternal PPD, Wang et al. (2021) identified negative life events as a major predictor of paternal PPD symptoms. Further, although this work has been conducted largely with majority population samples, similar results have been found linking negative life events to elevated PPD in a sample of predominantly Black, low SES mothers (Guintivano et al., 2018). Nonetheless, data on the extent to which negative life events are associated with the development of PPD for Black fathers is sorely lacking.

Low Inter-Parental Relationship Quality.

According to prior meta-analytic research, inter-parental relationship factors such as relationship dissatisfaction (Ansari et al., 2021) and distress (Chhabra et al., 2020) are important risk factors for the development of paternal PPD symptoms (Field, 2018; Roubinov et al., 2014). For example, Henshaw et al. (2023) examined partner dyads shortly after the birth of a child and found that fathers were more likely to report symptoms of depression when the mother reported

low levels of relationship satisfaction. In addition, Figueiredo et al. (2018) found that fathers who reported high levels of negative partner interaction also experienced a steeper increase in depression from 3 to 30 months when compared to fathers who had fewer negative partner interactions. Numerous other studies have documented similar findings linking relationship quality – including low levels of support and relationship satisfaction – to elevated postpartum depressive symptoms for both mothers and fathers with an infant (Don et al., 2012; Malus et al., 2016). Results from these existing studies suggest that the parental relationship is inextricably connected to postpartum mental health, and can act as an important predictor of paternal depressive symptoms.

Nonetheless, the majority of this research has been with mothers and has focused almost exclusively on married couples. Although it is possible that relationship quality may be considered a less critical predictor of fathers' psychological functioning for unmarried parents, some preliminary evidence suggests that the role of relationship quality is equally important when parents are co-parenting outside of marriage. For example, Zhang and Razza (2022) found that inter-parental relationship quality was a significant predictor of maternal postpartum depression among unmarried Black and White parents. Further, Paulson et al. (2011), found that even for non-resident fathers, the quality of relationship with their child's mother predicted paternal symptoms of depression, such that low-quality relationships were associated with increased reports of depressive symptoms. Collectively, past results speak to the potentially important role of relationship quality for postpartum adjustment among both married and unmarried parents, but the extent to which this association generalizes to unmarried, Black fathers is not yet known.

Child Temperamental Difficulty

According to Rothbart and Bates (2007), infant temperament consists of "constitutionally based differences in reactivity and self-regulation, in the domains of affect, activity and attention" (pp. 100). Most research on child temperament has focused on aspects of temperamental difficulty, which generally refers to the extent to which young children are difficult to soothe, struggle to regulate emotions, or are unable to adapt to new situations, people, or places (Bates et al., 1979). Temperament is often considered to be relatively stable across time (Bornstein et al., 2015), and has been examined as a risk factor for parental psychopathology in some prior studies (Brown et al., 1998; Clark & Watson, 1991).

The stress associated with raising a temperamentally challenging infant can have detrimental consequences for mental health. As such, the temperament of the infant after birth is also considered a risk factor for PPD symptoms in new parents (deMontigny et al., 2013), such that when the baby is highly difficult, irritable, or temperamentally challenging then postpartum distress increases for both fathers (Frost, 1996) and mothers (Beck, 1996). In a qualitative study examining fathers with infants, one common theme was feeling overwhelmed by the child; one father stated that the sleepless nights caused over-exhaustion and resulted in him feeling anger towards his infant if the baby cried for more than a few minutes (Eddy et al., 2019). In addition, reduced sleep due to the baby's temperamental characteristics can also increase the likelihood of developing paternal PPD symptoms (Paulson et al., 2006). Thus, deleterious effects on mental health can occur due to the physical and emotional exhaustion that often result from caring for a temperamentally difficult infant.

As with other risk factors of postpartum depression, the vast majority of research in this domain has focused on mothers. To the extent that temperament has been considered as a predictor of paternal depression, this work has largely been limited to studies of older children

and those in homogenous, married samples. For instance, temperamentally challenging characteristics were associated with paternal depressive symptoms among fathers in a small sample of pre-adolescents (Oldehinkel et al., 2006). In addition, aspects of temperamental difficulty were associated with elevated depressive symptoms among fathers of infants in a sample of almost entirely White, married couples with infants (Solmeyer & Feinberg, 2011). However, little attention has been given to the role of child temperament on paternal mental health in other populations. Particularly given that fathers may be more susceptible than mothers to the impact of child temperament (Brown et al., 2011), it is critical to better understand the extent to which these associations may hold in unmarried, Black fathers.

Experiences of Racism

Most empirical studies and nearly all systemic reviews and meta-analyses on paternal PPD have largely included participants with relatively homogenous socio-demographic characteristics (Kim and Swain, 2007; Perez et al., 2017). Similarly, research on paternal depression and PPD symptoms in the United States has focused predominantly on married and majority White populations (Ward & Mengesha, 2013). However, given socio-cultural and contextual influences on depressive symptoms, it stands to reason that the predictors of paternal PPD may show heterogeneity across different sub-populations within this country. As such, it is important to understand whether commonly identified risk factors for paternal PPD in racial majority samples will hold in this under-represented sample of unmarried, Black men.

Black parents are at increased risk for depressive symptoms following the birth of a child, due in part to institutional and historical factors that have led to contextual stress and mental health disparities in this population (Bailey et al., 2019; Potnis & Gala, 2020; Watkins et al., 2006). In a review of 19 publications focused on Black American men and depression over a period of 25 years, Ward and Mengesha (2013), found that, on average, prevalence estimates of

depression for Black men in the U.S. ranged from 5-10%. However, the emerging body of research regarding paternal depressive symptoms in the postnatal period has largely focused on White fathers, with very little information on the unique factors affecting Black fathers.

Black fathers often experience racism in both social structures and individual interactions (Bailey, 2021), which is detrimental for mental health (Hudson et al., 2016). According to a metanarrative of 13 studies by Miller (2021), individual or systemic discrimination was positively associated with symptoms of generalized depression for Black men. Further, many Black men in particular encounter instances of overt and covert racism and discrimination throughout their lives. Numerous studies point to the impact of experiences of racism on Black adults' depressive symptoms (Cavalhieri & Wilcox, 2022; Hudson et al., 2016). Moreover, Bamishigbin et al. (2017) have extended these findings to Black fathers of infants, documenting that Black fathers who experienced higher rates of individual racism were more likely to have higher rates of PPD symptoms a year after the birth of their child. Given this prior evidence and the need to better understand culturally-specific determinants of paternal PPD in Black parents, the present study also considered experiences of racism as a predictor of paternal PPD post-birth.

Social Networks and Depressive Symptomology

When examined in connection with mental health, social network structures can act as risk or protective factors for symptoms of depression (Rhodes et al., 1992; Santini et al., 2015). In particular, extant literature suggests that having high levels of network density (i.e., network members that are closely connected to one another) and transitivity (i.e., numerous smaller groups within the network) may have benefits for physical (Smith, & Christakis, 2008), social (Huxhold et al., 2013), and mental health (Rosenquiest et al., 2011). With regard to postpartum depression specifically, it is hypothetically easier for members of dense networks to communicate with each other and coordinate care and support for parents after the birth of a

child (Scott, 2017). In addition, having multiple clusters of network groups could help to meet multiple needs, such as one group providing emotional support during the postpartum period while another group is able to provide tangible support such as sharing childcare or homecare tasks. Indeed, higher density networks (Lam et al., 2017), as well as having a larger number of members in the network (Surkan et al., 2006), have both been shown to reduce the likelihood of developing symptoms of depression. Although these studies provide some support for the link between depressive symptoms and network density and transitivity, network research to date has been with predominantly White, female participants and not focused on the postpartum period.

According to the theory of experiential similarity (Thoits, 2011), individuals create networks and are drawn to people who have life experiences similar to their own. However, people are also likely to create networks consisting of multiple smaller groups. These smaller friend groups can collectively meet an expectant parent's many social and emotional needs. In social network analysis, the concept of having a network with multiple smaller groups is called transitivity (Borgatti et al., 2022). High rates of transitivity within social networks are associated with improved physical health (Perkins et al., 2015) and mental health (Aschbrenner, 2018). Thus, we expect transitivity – in which new parents can rely on support, information, and social capital provided from multiple clusters of network members – to also be related to fewer depressive symptoms. Prior research in this area has not adequately considered racial and ethnic minority populations in the United States and has not been concerned with depressive symptoms for fathers in the postnatal period. The present study is designed to meet this need.

Social Support and Parenting Among Black American Fathers

Although prior studies indicate a potential link between the structure of social networks and depressive symptoms, a gap in the literature persists with regard to how these structural aspects of social networks impact depressive symptoms for Black American fathers, who are

frequently overlooked in family and social science research (Hill, 2001). Black parents – particularly in low-resource environments – have many unique contextual factors that can impact network structure, as well as increase susceptibility to depressive symptoms (Orr et al., 2006; Ward & Mengesha, 2013).

Sociocultural and historical contexts are key factors in understanding the unique experience of social support for Black families. With a history of slavery, segregation, and other racist practices in the U.S., Black American families learned to rely on close, tight networks of both friends and family to provide support and resources via social capital (Boisjoly et al., 1995; Hunter et al., 2019). These patterns have largely persisted in communities of Black parents today. Within a social network context, Black individuals often report extended family or kinship networks of support, including aunties, uncles, grandparents, and cousins as close network members (Dressler, 1985). These kinship networks are especially important for families in low-resource communities who often depend on kinship networks to care for their children and offer both emotional and practical support where other resources are unavailable. For example, Burchinal et al. (1996) found that when African American mothers had a large social network, they were often more engaged and responsive to their infants' needs, likely because they were receiving necessary support and resources from those network members. Further, Reid and Taylor (2015) used over 4,000 reports from the Fragile Families and Child Wellbeing Study, to document that aspects of social support, especially closeness to both friends and extended family members was related to fewer depressive symptoms.

Understanding the effects of social network composition and structure on parental depressive symptoms for Black families is important for future research as well as practical application in therapy and community organization settings. Nonetheless, an exclusive focus on characteristics of network members provides an incomplete picture of the contributions that

social network dynamics can make to the mental health of new Black parents. Informed by ecological models of fatherhood (Cabrera et al. 2014), the present study was intended to document associations between structural network factors that characterize *connections between network members* and postnatal depressive symptoms among unmarried, Black fathers.

There are two primary pathways by which these social connections may affect men's depressive symptoms. The first is by directly affecting men's mental health in the perinatal period. This study will provide a conservative test of the main effects of structural network characteristics by considering the unique contributions of these social network connections to paternal depression even while accounting for other predictors. The second is that structural network characteristics will moderate the association between other predictors and paternal PPD. Specifically, it is plausible that social networks may exert their influence by buffering new fathers from the risks associated with negative life events, poor relationship functioning, temperamental difficulty, and/or experiences with racism. Both hypotheses will be tested in the present study.

Current Study

In sum, the current study investigates the following research questions: (a) To what extent are contextual risk factors including negative life events, low inter-parental relationship quality, temperamental difficulty, and experiences with racism related to paternal PPD symptoms? (b) Are structural social network characteristics associated with parental depressive symptoms over and above the contributions of other predictors? and (c) Do structural network characteristics moderate associations between contextual risk factors and paternal PPD? We developed the following hypotheses: (H1) Lower levels of relationship quality, and higher levels of negative life events, infant temperamental difficulty, and experiences with racism will be associated with greater levels of paternal PPD symptoms, (H2) Higher levels of density and

transitivity will be associated with fewer paternal PPD symptoms (H3) Density and transitivity will moderate associations between contextual risk factors and paternal PPD symptoms, such that when density and transitivity are high then the associations between contextual risk factors and PPD symptoms will be mitigated.

CHAPTER 4

METHODS

Participants

Participants consisted of Black fathers recruited from rural areas of Georgia. All fathers were expecting the birth of a new child when recruited, with the mothers in their second or third trimester of pregnancy (Wave 1; n = 126). Data collection visits occurred after the baby was born, at 3-6 months postpartum (Wave 2; n = 181). Fathers' ages ranged from 18 to 51 years old, M = 28.32 years; SD = 6.58. The median income of participants was $1800 per month and the mean was $2,012 per month, SD = $1,299. The majority of participants reported a high school diploma or GED (49%) as their highest level of education, 7% had not completed high school, 35% had completed some college or a technical certification, 3% had completed an associate degree, and 6% having completed a bachelor's degree or beyond. Approximately 72% of the fathers were working full time, 5% were working part-time, 18% were unemployed, with the remaining 5% either self-employed, working odd jobs, or disabled. With regard to both parents, 90% reported being in a committed relationship with the child's other parent, 8% in an on-again-off-again relationship, 1% as casually romantic (occasional intimacy without a defined relationship), and 1% as just friends. For 24% of the parents this was an unplanned pregnancy and for 76% it was a planned pregnancy. Expectant fathers were primarily residential, with 77% of the men reporting sleeping every night or most nights in the same home as the child's mother, 16% reporting occasionally sleep in the same home, and 7% reporting never sleeping in the same home as the child's mother.

Procedures

Black American research staff visited participants at their homes or completed remote visits using telephone and/or video conferencing technology when the infant was between 3-6 months old. Participants completed a series of surveys assessing demographic and other characteristics. During the same visits, fathers completed a social network interview (see Measures below for details). The social network data was collected using computer-aided interviewing software called EgoWeb (RAND Corporation and the University of California, Los Angeles, Kennedy et al., 2015) for collecting personal network data. Fathers received a $100 check for this visit. All study protocols were approved by the Institutional Review Board of the University of Georgia.

Measures

Depressive Symptoms

Fathers completed the Center for Epidemiologic Studies Depression scale (CES-D; Radloff, 1977). The CES-D consists of 20 items ranging on a scale from 1 = *Rarely or None of the Time*, to 4 = *Most or All of the Time* indicating how often they have felt that way over the past two weeks. Per standard practice, items were recoded to range from 0 to 3 and summed M = 8.32; SD = 9.74; α = .90. Example items include, “I felt depressed,” “I thought my life had been a failure,” and “I felt lonely.”

Negative Life Events

Negative life events were measured using the Negative Life Events scale (NLE; Kowal et al., 2007). The NLE consists of 15 items rated on a two-point scale with 0 = *No* and 1 = *Yes.* Participants were asked to indicate whether these events had occurred during the past year and items were summed, M = 2.03; SD = 2.62; α = .81. Example items included, “Did any close

friend or close relative die?", "Did you have any serious illness or injury?" and "Did you have serious trouble with the police or law?".

Low Inter-Parental Relationship Quality

Inter-parental relationship quality was measured using the relationship quality measure developed for the Fragile Families study (Carlson et al., 2004). It was adapted for unmarried fathers and uses all positively-worded relationship support items from the measure. The measure consists of 5 items rated on a three-point Likert scale ranging from 1 = *Never* to 3 = *Often.* Participants were asked to indicate how frequently their partner instigates positive interactions, $M = 12.62$; $SD = 2.78$; $\alpha = .95$. Example items included, "How often is your child's mother fair and willing to compromise?", "How often does your child's mother encourage you or help you with things that are important to you?" and "How often does your child's mother really understand your hurts and joys?"

Infant Temperamental Difficulty

Infant temperament difficulty was measured using subscale of the Infant Characteristics Questionnaire (ICQ; Bates et al., 1979), which was developed to examine the extent to which a child was considered to have difficult or fussy behaviors. The ICQ fussiness subscale consists of 7 items on a six-point scale with lower scores indicating a less difficult child and higher scores indicating higher levels of difficulty in managing the child's behaviors and emotions, $M = 2.27$; $SD = .72$; $\alpha = .84$. Example items included, "How much does your baby cry and fuss?", "How often or how quickly does your baby's mood change?" and "Please rate the overall degree of difficult your baby would present for the average parent."

Experiences with Racism

Experiences with racism were measured using the Experiences with Racism Questionnaire (ERQ; Harrell, 2000), which was developed to assess common experiences of racism among Black Americans. The ERQ consists of 9 items on a four-point Likert-type scale ranging from 0 = *Never*, to 3 = *Frequently*, with higher scores indicating more frequent experiences with racism, $M = 6.35$; $SD = 6.55$; $\alpha = .94$. Example items included, "Have you been ignored, overlooked, or not given service because of your race?", "Did others respond to you as if they were afraid because of your race?" and "Have you been called a name or harassed because of your race?"

Social Network Interview

Participants completed social network interviews remotely over the phone, with the assistance of a trained research assistant. They were given an initial prompt to think about the important people in their lives, who they often have contact with, and who they would consider close. They were then asked to list up to 15 individuals (alters) that are important figures in their lives. They were first asked to name the child's other parent, followed by the invitation to list 14 other people. Finally, they were invited to think about having their baby and to list five additional people who might be impactful in helping them to raise their child. The average number of alters listed for fathers was 17. Participants then answered several questions about each member of their network, including how they know each person, whether and it what way they were related, and what their family and financial situations were like.

Fathers were then asked to report which members of their network knew each other, with follow-up probes assessing how well they knew one another (i.e., not well, well, or very well). These questions allowed for the construction of network structure variables. The extent to which

individual members knew each other very well was selected as the "edge" for constructing structural network variables. An "edge" in social network analysis refers to a line drawn between two individuals in a network who know one another (Wasserman & Faust, 1994). These edges, or the lines drawn between people, create the construction of the graph for social network analysis, which in turn is how density and transitivity are both calculated (see Chapter 3: Social Network Analysis for more detail). The ego (i.e., participating father) was not included in these structural measures, consistent with common practice and recommendations in the social network literature (McCarty, 2002).

Control Variables

Demographic control variables included age, income, education, relationship with mother of child (i.e. committed romantic relationship, casually seeing each other, just friends), and whether or not the pregnancy was planned (see Table 1 for demographic characteristics). With regard to the relationship with the mother, 90% of the fathers identified being in a serious, committed relationship with the child's mother. Due to low frequencies for some responses, this variable was re-coded as 1 = in a serious committed relationship, and 0 = other relationship status (i.e. casually seeing each other, just friends, etc.).

Analysis Plan

All structural network measures were derived using the igraph package in R (R Core Team, 2021). The ego was removed for these calculations, following generally accepted methods for social network analyses (Freeman, 1979; Wasserman & Faust, 1994). All other analyses were performed using Stata 15.1 (StataCorp, 2017). The edges of the network were defined according to what extent to people know each other very well, as opposed to simply knowing each other or knowing each other well. Because the networks in this population were expected to be highly dense, this definition was considered the best reflection of variability in the structure of network

characteristics for this sample. Structural network characteristics calculated include density (the probability that any random two people in a network know each other very well) and transitivity (the tendency of network members to fall into groups within the network). Observed scale scores were calculated for paternal depression, as well as all other contextual risk factors including negative life events, inter-parental relationship quality, infant temperamental difficulty, and experiences with racism.

It was anticipated that the social network structural characteristics would be highly correlated with one another. Therefore, in order to avoid issues with multicollinearity, separate regression analyses for each network characteristic were performed. To examine main effects on paternal PPD, these analyses included all demographic covariates (i.e., age, economic distress, education, relationship with mother of child, and whether or not the pregnancy was planned) on the first block, all contextual risk factors (i.e., negative life events, inter-parental relationship quality, infant temperamental difficulty, and experiences with racism) on the second block, and each social network characteristic (density and transitivity) in separate models on the third block of hierarchical linear regressions predicting paternal PPD symptoms.

To examine social network structure characteristics as a moderator in these models, interaction terms between contextual risk factors and social network structural characteristics were created, with predictors and moderators centered at the mean. Each model tested 4 separate interaction terms (i.e., density x negative life events, density x inter-parental relationship quality, etc.), which were added to a 4^{th} step of the regression equations. Significant interactions were then probed using Johnson-Neyman plots to assess regions of significance of the moderator in each model, as well as simple slopes plotted at the mean and one standard deviation above and below the mean of the moderator.

CHAPTER 5

RESULTS

Preliminary Analyses

Means and standard deviations for all study variables are presented in Table 1. Network structure variables were calculated using guidance from McCarty (2002) to calculate density and transitivity. These descriptive statistics indicated that fathers in this sample had high levels of density and transitivity relative to other studies (Jackson et al., 2014), implying that on average social networks consisted of tightly connected groups of network members, and that the vast majority of individuals in these networks knew one another very well. Because of this there was a somewhat restricted range in this sample in terms of both density and transitivity, with numerous participants scoring at the maximum value for one or both measures when defining the edge for network characteristics as "knows this person well". This further justified the decision to utilize "knows this person very well" as the edge for calculation of structural network characteristics, as there was substantially greater variability among participants when density and transitivity were calculated this way. As such, both density and transitivity were defined by whether network members reported knowing one another "very well", and these variables were used for subsequent analyses.

The scores for depressive symptoms were in the moderate range and roughly similar to what has been observed in other community samples of new, Black fathers not at risk for depression (Hunt et al., 2015; Watkins et al., 2011), and the variability for depressive symptoms was relatively high. Overall, around 22% of participants scored above the generally accepted

clinical cut-off score of 16 on the CES-D (Radloff, 1977), which is higher than most other similar samples of new fathers (Vilagut et al., 2016; Ward & Mengesha, 2013).

Bivariate correlations among study variables are presented in Table 2. Intercorrelations among predictor variables indicated that negative life events were associated with more experiences with racism, as well as lower levels of both density and transitivity in social networks. Network density was also associated with higher levels of temperamental difficulty. As expected, the two structural network characteristics of density and transitivity were strongly positively correlated, thus supporting the decision to analyze these network characteristics in separate regression models due to potential multicollinearity. In addition to correlation analyses with continuous variables, independent samples t-tests showed no significant differences in paternal PPD symptoms as a function of relationship status, $t = -1.66$, $p = .09$. Paternal PPD symptoms did also not differ as a function of whether the pregnancy was planned or unplanned $t = .70$, $p = .48$.

Correlations among primary study variables showed several bivariate associations between predictors and paternal depressive symptoms. Depressive symptoms were associated with more negative life events and experiences with racism, as well as with lower levels of inter-parental relationship quality. In terms of structural network characteristics, symptoms of depression were associated with lower levels of both social network density and transitivity. Demographic covariates were unrelated to most other primary study variables, with the exception of education being negatively associated with experiences with racism. Power analyses indicated that the likelihood of detecting an effect size of .20 (similar in magnitude to reported significant effects) at an alpha value of .05 in regression models with this sample size was .78, suggesting a relatively low likelihood of Type II error.

Missing Data

Percentages of missing data for all variables included in the analyses were examined, focusing specifically on variables with above 5% missing data. According to these results, infant temperamental difficulty (11.2%), structural network characteristics (8%), and relationship status with the child's mother (14.4%), were all missing substantial data. Tests for missing completely at random or missing at random were non-significant, indicating that values may be assumed to be missing completely at random. Missing values were imputed using multiple imputation for all variables with 3% or more of the data missing per standard practice for regression analyses (Hoffman & Shafer, 2015). In addition, all predictors and moderators were centered at the mean prior to performing regression analyses.

Hierarchical Linear Regression Analyses

Preliminary Analyses Examining Demographic Covariates

In order to examine the impact of all predictors on paternal PPD symptoms a series of hierarchical linear regression analyses were performed. The first preliminary, exploratory regression analysis examined only socio-demographic covariates (i.e. age, income, paternal education, whether or not the father was romantically involved with the mother, and whether or not the pregnancy was planned) as predictors of paternal PPD symptoms on a single step to determine whether these variables should be included as covariates in subsequent models (see Table 3). The model explained a statistically significant 5% of the variance in PPD symptoms, R^2 = .05, $F(5, 176) = 1.85$, $p = .10$. However, none of the covariates were significant predictors of paternal PPD symptoms. Given that a) all covariates failed to predict paternal PPD, and b) covariates were also not related to paternal PPD in bivariate analyses, demographic covariates were dropped and not included in subsequent regression analyses.

Main Effects of Contextual Risk Factors

The first step in the regression analyses included the four primary contextual risk factors (i.e. negative life events, low inter-parental relationship quality, temperamental difficulty, and experiences with racism) on a single block of a regression equation predicting paternal PPD symptoms (see Table 4). These variables together explained 16% of the variance in PPD symptoms for fathers, $R^2 = .16$, $F(4, 160) = 7.12$, $p < .001$. Consistent with bivariate correlations, poor inter-parental relationship quality was the strongest predictor of paternal depressive symptoms. Negative life events were also associated with higher levels of paternal PPD symptoms. In addition, and contrary to expectations, low infant temperamental difficulty was associated with higher paternal depressive symptoms. Experiences with racism was not a significant predictor in the model including all risk factors.

Main Effects of Structural Social Network Characteristics

Separate regression analyses were then conducted to test for main effects of social network characteristics by adding either density or transitivity to the second step of the equation. These analyses tested whether density or transitivity predicted paternal PPD symptoms over and above the combined effects of all four contextual risk factors. Consistent with the proposed analytic plan -- and due to very high multicollinearity between the two variables -- distinct models for density and transitivity were tested.

The first model included density as the structural social network characteristic (see Table 5). This model overall explained 21% of the variance in PPD symptoms for fathers, $R^2 = .21$, $F(5, 150) = 8.00$, $p < .001$. Network density was a significant predictor of paternal PPD symptoms over and above all other predictors and explained an additional 5% of the variance in paternal depressive symptoms. These results indicated that lower levels of network density were associated with fathers' reporting more depressive symptoms in the postpartum period. In the

final step of the regression equation, both low relationship quality and negative life events remained significant predictors of paternal PPD symptoms, whereas experiences with racism were marginally associated with higher depressive symptoms. Infant temperamental difficulty was a non-significant predictor in the model.

A separate regression equation including transitivity as the structural social network characteristic on the second block was tested next (see Table 6). This model overall explained 22% of the variance in PPD symptoms for fathers, $R^2 = .22$, $F(5, 150) = 8.46$, $p < .001$. Transitivity was a significant predictor of paternal PPD symptoms in this model, over and above other predictors, explaining an additional 6% of the variance in paternal PPD symptoms on its own. Results indicated that lower levels of transitivity were associated with elevated depressive symptoms in fathers. With regard to the main contextual risk factors, low relationship quality and negative life events remained significant predictors of paternal PPD symptoms whereas infant temperamental difficulty and experiences with racism were non-significant predictors.

Moderation Analyses

To test moderational hypotheses, a series of interaction terms between contextual risk factors and structural network characteristics were created. This included centering all predictors and computing 4 interaction terms examining density as a moderator of associations between contextual risk and paternal PPD symptoms (i.e., negative life events x density, low relationship quality x density, temperamental difficulty x density, experiences with racism x density), and 4 interaction terms examining transitivity as a moderator of associations between contextual risk and paternal PPD symptoms (i.e., negative life events x transitivity, low relationship quality x transitivity, temperamental difficulty x transitivity, experiences with racism x transitivity). Interaction terms were tested one at a time in separate models due to power limitations and high multicollinearity among predictors. In each case all 4 contextual risk factors were included on

the first step of a regression equation predicting paternal PPD symptoms. Standardized scores for density or transitivity were then included on a second step of this equation. Each interaction term was then added on the final step. Post hoc probing followed according to protocols outlined in Aiken and West (1991), with simple slopes plotted at low (one standard deviation below the mean), moderate (mean), and high (one standard deviation above the mean) values of the moderator. The Johnson-Neyman technique identified values of the moderator at which the association between independent and dependent variables were significant.

Negative Life Events

The model including the density x negative life events interaction term explained 23% of the variance in PPD symptoms for fathers $R^2 = .23$, $F(6, 149) = 8.14$, $p < .001$ (see Table 7a). However, the interaction term between negative life events and density was not a significant predictor. The model including the transitivity x negative life events interaction term explained 25% of the variance in PPD symptoms for fathers $R^2 = .25$, $F(6, 149) = 10.69$, $p < .001$ (see Table 7b). The interaction term between negative life events and transitivity was also non-significant.

Low Inter-Parental Relationship Quality

The model including the density x relationship quality interaction term explained 25% of the variance in PPD symptoms for fathers $R^2 = .25$, $F(6, 149) = 11.13$, $p < .001$ (see Table 8a). In this model the interaction term between relationship quality and density was marginally significant. The simple slopes analysis indicated that there was a significant association between higher levels of inter-parental relationship quality and greater paternal PPD symptoms at low and moderate levels of density. This association was not significant among men whose social networks had high levels of density (see Figure 1). A Johnson-Neyman plot indicated that the

association between relationship quality and paternal PPD symptoms was non-significant at all values 0.85 standard deviations or higher above the mean of density.

The model including the transitivity x low relationship quality interaction term explained 27% of the variance in PPD symptoms for fathers, $R^2 = .27$, $F(6, 149) = 28.76$, $p < .001$ (see Table 8b). In this model the interaction term between inter-parental relationship quality and transitivity was a significant predictor of paternal PPD symptoms over and above all main effects. Consistent with the results examining density as a moderator, the simple slopes analysis again indicated that there was a significant association between higher levels of inter-parental relationship quality and greater paternal PPD symptoms at low and moderate levels of transitivity. This association was not significant among men whose social networks had high levels of transitivity (see Figure 2). A Johnson-Neyman plot indicated that the association between relationship quality and paternal PPD symptoms was non-significant at all values 0.20 standard deviations or higher above the mean of transitivity.

Temperamental Difficulty

The model including the density x temperamental difficulty interaction term explained 25% of the variance in PPD symptoms for fathers, $R^2 = .25$, $F(6, 149) = 9.21$, $p < .001$ (see Table 9a). The interaction term between temperamental difficulty and social network density was significant and explained additional 4% of the variance in postpartum depression. The simple slopes analysis showed that the association between temperamental difficulty and paternal PPD was not significant at low or moderate levels of social network density. However, temperamental difficulty was related to significantly *fewer* depressive symptoms among new fathers when social networks were highly dense (see Figure 3). A Johnson-Neyman plot indicated that the association between infant temperamental difficulty and paternal PPD symptoms was significant at all values 0.55 standard deviations or more above the mean of density.

The model including transitivity x temperamental difficulty interaction term explained 25% of the variance in PPD symptoms for fathers, $R^2 = .25$, $F(6, 149) = 9.21$, $p < .001$ (see Table 9b). The interaction term between temperamental difficulty and transitivity was also significant in this model, accounting for 5% more of the variance in paternal PPD. Similar to the moderating effects of density, there was no significant association between temperamental difficulty and PPD symptoms at low or moderate levels of transitivity, but infant temperamental difficulty was associated with fewer paternal PPD symptoms at high levels of transitivity (see Figure 4). A Johnson-Neyman plot indicated that the association between infant temperamental difficulty and paternal PPD symptoms was significant at all values 0.40 standard deviations or more above the mean of transitivity.

Experiences with Racism

The model including the density x experiences with racism interaction term explained 24% of the variance in PPD symptoms for fathers, $R^2 = .24$, $F(6, 149) = 7.73$, $p < .001$ (see Table 10a). The interaction term between experiences with racism and density was marginally significant. The simple slopes analysis indicated that experiences with racism were related to higher reports of paternal PPD symptoms only among fathers whose social networks were low on density. Experiences with racism were not significantly associated with depressive symptoms at moderate or high levels of social network density (see Figure 5). A Johnson-Neyman plot indicated that the association between experiences with racism and paternal PPD symptoms was significant at all values .20 standard deviations below the mean of density or lower. The model including the transitivity x experiences with racism interaction term explained 25% of the variance in PPD symptoms for fathers $R^2 = .25$, $F(6, 149) = 8.20$, $p < .001$ (see Table 10b). The interaction term between experiences with racism and transitivity was not a significant predictor in this model.

CHAPTER 6

DISCUSSION

Findings from the current study provide new evidence on risk and protective factors for the development of postpartum depressive symptoms among unmarried, Black fathers. Specifically, and largely consistent with some previous studies (e.g., Chhabra et al., 2020; deMontigny et al., 2013; Wang et al., 2021), negative life events, poor inter-parental relationship quality, and infant temperamental difficulty were all risk factors for paternal PPD symptoms. However, structural characteristics of social networks, specifically density and transitivity, may play a protective role in the development of paternal PPD symptoms. Specifically, higher network density (every person in a social network being closely connected to each other), and transitivity (more smaller groups within a social network), were directly associated with fewer depressive symptoms, over and above the effects of contextual risk factors. Further, the links between some contextual risk factors and paternal PPD symptoms were attenuated when social network density and transitivity were high. Thus, the current study provides some support for the hypothesis that social network structure plays an important role in buffering against the impact of contextual risk factors on symptoms of depression for Black fathers during the postpartum period.

Descriptive Sample Characteristics

Descriptive statistics indicated substantial variability in depressive symptoms in this sample. Although the sample as a whole was far from a clinically depressed sample and was not selected specifically for risk of depression, over 20% of participants met the standard criterion score for clinical depression on the CES-D. This number is generally higher than most studies

and reviews of paternal postpartum depression, which typically range between 8-10% (Paulson & Bazemore, 2010; Scarff, 2019; Ward & Mengesha, 2013). Thus, the sample can be characterized as at moderate risk for depressive symptoms relative to other samples with different sociodemographic characteristics. Given the reluctance of many Black men to discuss or report depressive symptoms (Bailey et al., 2021), it is plausible that the prevalence of depressive symptoms may be even higher in the broader population. Because so few studies have focused exclusively on unmarried, Black fathers (Ward & Mengesha, 2013), results from this study add to the emerging body of research on base rates of depressive symptoms specifically within this population.

In terms of social network characteristics, the networks in this sample of new fathers were extraordinarily closely connected. Overall, there were very high levels of both density and transitivity within networks, even when defining network connections only as those who "knew each other very well." In practice, this means that for many fathers in this study all members of their network knew every other member of their network well or very well. The levels of density and transitivity reported here are substantially higher than what has been reported in many other populations completing egocentric social network interviews. For example, in several studies of low-income, Black and White newlywed couples, levels of network density were between .20 and .30 (e.g., Jackson et al., 2014; Kennedy et al., 2023), several orders of magnitude lower than the current sample. This supports the notion that many unmarried, Black fathers in particular may be part of closely connected and intertwined social networks and may lean on those networks to facilitate support for a new baby (Dressler, 1985; Hunter et al., 2019).

Contextual Risk Factors and Paternal Postpartum Depressive Symptoms

Low Relationship Quality

Inter-parental relationship quality had the most robust direct effect on paternal depressive symptoms, remaining a significant predictor of paternal PPD symptoms throughout all regression models tested. These findings support previous studies linking deficits in inter-parental relationship quality to a greater likelihood of paternal symptoms of depression (Ansari et al., 2021; Field, 2018). Much research on the role of inter-parental relationships in postpartum depression has focused on the connection between maternal and paternal mental health in the postpartum period (Paulson & Bathezmore, 2010). However, the current findings are consistent with some prior studies in documenting that high quality relationships (including satisfaction, communication, and mutual affection) between mothers and fathers may play a role in reducing the risk of fathers developing symptoms of PPD (Gustavson et al., 2012). However, if the inter-parental relationship includes negative, conflictual, or hostile interactions, then the risk of developing symptoms of paternal PPD increases (Figueiredo et al., 2018).

The quality of the relationship between mother and father has long been considered a critical factor in parents' adjustment across the transition to parenthood, particularly in promoting high quality parent-child relationships (Hoffmann et al., 2023; Seefeld et al., 2022). Moreover, substantial theoretical and empirical work has posited that fathers are more affected by the quality of inter-parental relationship functioning than mothers (Brown et al., 2010). Although these studies have largely been conducted with middle class, married parents, some evidence suggests that the role of inter-parental relationship quality is equally and perhaps even more impactful for fathers in unmarried and low SES contexts. For instance, data from the Fragile Families and Child Well-Being Study has established links between both early inter-parental relationship functioning and coparenting quality and later parent-child relationship

quality (e.g., Fagan et al., 2009; Fagan & Palkovitz, 2019). Current findings add to this literature by reinforcing the importance of couple relationship functioning for unmarried, Black families not just for fathering behavior but for the mental health of fathers in the postpartum period.

Negative Life Events

Similar to inter-parental relationship quality, negative life events were a risk factor for paternal PPD symptoms, such that when the number of negative events was high then reports of paternal PPD symptoms were also high. These findings support some prior studies indicating that negative life events are associated with increased likelihood of both clinical diagnoses of depression and sub-clinical levels of depressive symptoms (Assari & Lankarani, 2016; Kendler et al., 1999). Indeed, the accumulation of multiple negative events within a short span of time, such as the death of a loved one, job loss, or serious illness, combined with the stress and responsibilities of caring for a newborn baby, could lead directly to psychological distress and/or increase the risk of activating biological vulnerabilities that may be responsible for developing paternal PPD symptoms (Flouri et al., 2018; Wang et al., 2021). Whereas much recent work has focused on adverse childhood experiences as creating vulnerabilities for mental health struggles (Giano et al., 2021; Youseff et al., 2017), our findings suggest that contemporaneous stressors in the recent past (i.e., in the prior year) may also pose risks for depressive symptoms among men who are already undergoing the often stressful transition of the addition of a new child (Hunt et al., 2015; Knoester & Petts, 2017).

Infant Temperamental Difficulty

During the initial analyses examining risk factors, infant temperamental difficulty paradoxically predicted lower levels of paternal PPD symptoms over and above other risk factors. Although this association did not persist after social network characteristics were included in the analyses, results provide some modest and surprising support for the notion that

more temperamentally fussy and challenging infants may be beneficial for the mental health of some fathers. Fathers in this study receive a uniquely high level of support from family and close friends, so it is possible that infant temperamental difficulty is not a direct risk factor (when taking into account social network characteristics) because parents with temperamentally difficult infants are more likely to receive material and emotional support from family and friends (Rosenquiest et al., 2011). It may also be that fathers with fewer depressive symptoms may be more engaged and attuned to their child's particular temperamental tendencies (including irritability, irregularities in biological rhythms, and fussiness) in a way that fathers who are more depressed and withdrawn from their children may not.

It also seems likely that the link between temperamental difficulty and reduced paternal PPD symptoms may be unique to this population of men, relative to other populations of parents that are more commonly studied (i.e., those who are married and consistently residing with their children). In the present sample of unmarried fathers there was variability in paternal engagement and residential status, with a substantial minority of fathers not consistently living with their children. These men may still be affected by infant temperamental characteristics during proximal interactions with their children, but temperamental difficulty may not necessarily cause the day-to-day stress that could increase risk for developing symptoms of PPD among men who reside consistently in the same home as their children (Knoester & Petts, 2017).

Experiences with Racism

Fathers' individual experiences with racism were not a direct risk factor for paternal PPD in the present study. Racism, and the stress associated with discrimination and racial trauma, can negatively impact numerous domains of mental, social, and physical health for many young, Black men (Bailey et al., 2019; Potnis & Gala, 2020). The effects that racism can have on Black fathers specifically are myriad (Cavalhieri & Wilcox, 2022; Miller, 2021). However, this study

utilized a brief measure of discrete experiences with racism (Harrell, 2000). As such, the full range of experiences that Black men may face over the course of their lives is unlikely to be captured here.

Further, many responses to racism include high-intensity negative emotions including anger, frustration, or stress (Murillo, 2023; Stevenson, 1998). These reactions may well take a biological and psychological toll on fathers, but they differ markedly from symptoms of depression captured by traditional depression scales, including the CES-D. It is worth noting that experiences with racism were associated with elevated paternal PPD symptoms in bivariate correlations, though this association did not persist when other risk factors were included in the analyses. This suggests that other risk factors that covary with experiences of racism may better explain depressive symptoms.

Social Network Structure and Paternal Postpartum Depressive Symptoms

Findings from the present study are the first empirical results to document associations between structural characteristics of social networks and paternal PPD symptoms. As hypothesized, dense social networks in which many or all network members knew one another very well were associated with fewer symptoms of paternal PPD. Having a network of individuals who know each other well and are close to one another may represent greater social connection and reduced loneliness, each of which are associated with positive mental health outcomes (Bäckström et al., 2021; Dressler, 1985; Lam et al., 2017; Perkins et al., 2015). It is also possible that dense social networks serve as a proxy for similarity in characteristics, attributes, and personality among network members. Thus, these results support the notion that social networks may exert positive influences on individual development through the provision of "bonding" social capital, in which members who are similar to one another form tightly

connected networks that allow for greater social cohesion and attendant mental health benefits (Geys & Murdoch, 2010).

Similarly, higher levels of social network transitivity were also associated with fewer symptoms of paternal PPD. The tendency of network members to fall into sub-groups within the network while also staying connected with each other may be another key characteristic of social support systems that helps to facilitate positive adjustment post-birth. New fathers who have a close network of friends and family that is also divided into multiple smaller groups may best be able to have their needs met by these different groups within their social network. This can provide greater access to emotional and material support and less likelihood of developing symptoms of depression such as loneliness, isolation, or extreme sadness (Bäckström et al., 2021). In line with the theory of experiential similarity (Thoits, 2011), individuals typically gravitate to friends and family who hold similar life experiences, but they may require multiple groups for the many different life experiences they undergo. Network transitivity can allow one to draw from closely connected social groups that may be relevant for various life experiences including parenting, romantic relationships, financial struggles, social problems, struggles with racism, and emotional support (Rosenquiest et al., 2011). When these many needs are being met by multiple people with similar experiences, then participants are more likely to show adaptive trajectories of mental health (Thoits, 2011).

Moderation Analyses

Low Interparental Relationship Quality

According to the results from moderation analyses, poor relationship quality was a risk factor for increased symptoms of paternal PPD only when density and transitivity were low or moderate. Among individuals with more loosely connected social networks and fewer cohesive groups within the network, then low relationship quality may continue to contribute to paternal

PPD (Don et al., 2012; Malus et al., 2016). To the extent that unmarried, Black fathers are reliant on social networks to provide material and emotional assistance, it may be challenging to fully access that support when social network members are loosely connected to one another. For instance, network members who do not know each other well or who are not part of closely connected groups may be able to offer individual support to a new parent whose relationship with the child's mother is sub-optimal. But as a whole these networks would be less likely to communicate with one another about the needs of the new father or combine resources/capital to assist him during stressful circumstances.

In contrast, when density and transitivity were high then poor relationship quality was no longer a risk factor for paternal PPD, suggesting that social network characteristics played a protective role in the context of interparental relationship distress. In networks high in density and transitivity, fathers are more likely to receive care and support from tightly connected individuals and from multiple connected groups, thus having needs met through their network. When a father's well-being is affected by conflict in the inter-parental relationship, the flow of information and resources within networks high on density and transitivity can make it easier for network members to work together and provide support, resources, and open communication (Scott, 2012). Prior evidence suggests that social support is associated with fewer symptoms of depression for fathers (Short et al., 2023). Our findings extend this work by demonstrating that close, tight, networks with multiple groups can help promote mental health for Black fathers, even when relationship quality may be low.

Experiences with Racism

Although only marginally significant, it is notable that nearly identical patterns emerged for the contextual risk factor of experiences with racism. Specifically, at low and moderate levels of density more experiences with racism were associated with more symptoms of paternal PPD.

Experiences with racism have been associated with symptoms of paternal PPD in other studies and may require social support to help alleviate potential mental health consequences (Bamishigbin et al., 2017; Cavalhieri & Wilcox, 2022; Hudson et al., 2016). Loosely connected social networks may struggle to provide this necessary support. In contrast, when networks were dense the link between experiences with racism and paternal PPD was no longer significant. According to Cooper et al. (2021), many fathers rely heavily on their community to help them emotionally process experiences with racism, but to encourage them to stay present and engaged with child(ren) in the face of race-related stress. One father stated, "It was the community that said we are not going to let you fail" (Cooper et al., 2020). The ability to mount community-level support efforts for struggling parents might be made easier when members of a network know each other well and can bond together to provide this support.

Infant Temperamental Difficulty

Network density and transitivity also moderated associations between infant temperamental difficulty and paternal PPD, although this effect showed a somewhat different pattern than what was observed with other contextual risk factors. Temperamental difficulty was unrelated to depressive symptoms at low or moderate levels of density and transitivity. However, at high levels of density and transitivity temperamental difficulty was associated with *fewer* paternal PPD symptoms. This result was surprising, as we expected that infant temperamental difficulty would increase the risk of paternal PPD symptoms, and that the association would be exacerbated when density and transitivity levels were low to moderate.

Nonetheless, this finding is broadly consistent with other results in documenting the potential protective effects of network density and transitivity in the face of contextual stress. In this instance, for fathers with closely connected networks temperamental difficulty appeared to actually be beneficial for mental health. It is possible that having closely connected networks

with multiple friend groups may provide opportunities for increased engagement with one's child, particularly if that child is temperamentally challenging. For example, when fathers receive sufficient social support and have access to networks that can help coordinate support for them, then having a baby with fussy temperamental tendencies may actually present opportunities for bonding and connection that promote mental health in the postnatal period (McKenzie & Carter, 2013; Torche & Rauf, 2021). Limited research has shown that temperamental difficulty can in some instances have steeling effects on family dynamics across the transition to parenthood. For instance, some couples are more likely to develop supportive coparenting partnerships when a baby is temperamentally difficult as opposed to temperamentally easy, due to increased opportunities to work together as parents (Schoppe-Sullivan et al., 2007). Similarly, fathers with closely connected networks may have more opportunities to engage in caregiving behaviors when babies are temperamentally difficult rather than easy. As such, for these men challenging temperamental characteristics could help them feel more efficacious and perhaps even closer to their child, both of which are linked to a reduction in depressive symptoms (Bamishigbin et al., 2017; Gross & Marcussen, 2017).

Negative Life Events

For the analyses with negative life events as contextual risk factor, neither density nor transitivity buffered the effects of negative life events on paternal PPD symptoms. Negative life events can often be traumatic, including the loss of a family member or loved one, being the victim of a crime, or job loss (Kowal et al., 2007). Whereas the other risk factors (i.e., having a temperamentally fussy baby or a sub-optimal relationship with the child's mother) can be reduced with the help of social networks, it might be that the traumatic experiences that constitute negative life events affect paternal PPD symptoms regardless of how the social network is constructed.

Overall Summary

These findings provide the first empirical evidence linking social network characteristics to paternal postpartum depressive symptoms. This work extends prior research by documenting the importance of having closely connected social network members and interconnected social groups for unmarried, Black fathers in the postpartum period. In general, results partially supported the hypothesis that social network density and transitivity may buffer against the negative impact of some contextual risk factors on paternal PPD, showing some main effect associations as well as moderating the extent to which contextual risk was related to PPD. Notably, many benefits of social network density and transitivity were only realized when contextual risk was high. The structural characteristics of social networks may be only tertiary contributors to fathers' mental health when contextual stress is low. However, when risk factors for PPD are elevated the importance of social networks becomes more salient (Armstrong et al., 2005; Bäckström et al., 2021; Dressler, 1985). The protective effects of social networks may be magnified by risks experienced in high-stress contexts.

Limitations and Future Directions

The results from this research add to the current body of literature on social networks and paternal postpartum depression while shedding new light on risk and protective factors in the largely under-represented population of unmarried, Black fathers. However, there are several substantial limitations and opportunities for further research in these domains. First, the focus of this study is on fathers, with all self-report and interview data coming from fathers exclusively. Family systems perspectives may further inform this line of research by elucidating potential differences or similarities in predictors of PPD for mothers vs. fathers, and potential bidirectional influences between maternal and paternal depressive symptoms. Moreover, data on duo-centered network structures (e.g., Kennedy et al., 2015) characterizing the overlap of network members

between mothers and fathers could be critical for determining the combined effects of mothers' and fathers' networks for postpartum adjustment.

Second, data from only a single point in time is considered in these analyses. Substantial future work is needed to track the developmental course of paternal PPD symptoms and social networks from pre-birth through later stages of childhood. Examining multiple points in time will also further elucidate directions of effects among study variables and help to identify underlying mechanistic processes linking social and contextual characteristics to men's mental health. Given potentially bidirectional associations among some study variables, additional research is needed to establish causal directions and determine mediating processes that may be operating to effect paternal PPD symptoms.

In addition, although for this unique group of unmarried, Black fathers, this sample is sizeable (Bailey et al., 2019; Ward & Mengesha, 2013), sample size limitations prohibit some more complex analytic strategies. Further, the extent to which results from this population of parents might (or might not) generalize to other groups with diverse socio-demographic characteristics is unknown. Future research with larger and more heterogenous samples is critical for subsequent research in this area.

Finally, the structural network characteristics examined in these analyses only partially characterize the qualities and attributes of a network. Future research can more holistically examine social networks by examining other structural factors such as measures of centrality. Moreover, no details regarding the personal characteristics of the alters has been included. Future analyses can include details regarding the characteristics of individual network members and the constellations of network characteristics (both personal and structural) that best facilitate optimal adjustment to the birth of a new child.

Conclusion and Clinical Implications

According to the results from this study, network structures may impact paternal depressive symptoms during the postnatal period. Having higher density and more groups in a network may well play a role in decreasing risk for depressive symptoms among unmarried, Black fathers. The implications of these results can affect how paternal depressive symptoms are viewed in therapeutic, research, and community settings. Although depression is often treated as an individual psychological disorder, this work demonstrates that depressive symptoms in the postnatal period are a) socially constructed via risk factors in multiple ecological contexts, and b) potentially mitigated by close connections among individuals and groups in one's social network. Thus, findings confirm the impact that close relationships can have on mental health and additionally support the idea that individuals in low-resource environments are affected not just by their own social relationships but by the relationships among members in their network. Many new fathers may rely on these networks to navigate the challenges and stressors endemic to the postpartum period.

Within therapeutic settings, a greater focus can be placed on not only including members of the network to offer support, but also encouraging fathers to solidify network connections and to rely on the close bonds that may already exist. Within research settings, social network analyses can be further employed to examine the effects of network structure, network members, and duo-centric relationships on paternal PPD systems. Social network analyses provides many opportunities to understand fathers and mothers in contexts beyond their own relationship and within broader systems in which parents reside.

The extent to which structural social network characteristics are malleable remains an empirical question. Nonetheless, interventions, preventive interventions, and community resources focused on promoting paternal mental health may be well-served by integrating

discussion of social network dynamics. New and expectant fathers who rely on social network members that are closely connected to one another as individuals and in groups may be better prepared to navigate the transition to a new child. Practitioners and public health initiatives can capitalize on the unique strengths and tightly connected networks that already exist for many Black parents to successfully reduce new fathers' vulnerability for PPD symptoms after the birth of a child.

References

Anderson, E. A., Kohler, J. K., & Letiecq, B. L. (2005). Predictors of depression among low-income, nonresidential fathers. *Journal of Family Issues, 26*(5), 547-567. https://doi.org/10.1177/0192513X04272753

Ansari, N. S., Shah, J., Dennis, C. L., & Shah, P. S. (2021). Risk factors for postpartum depressive symptoms among fathers: A systematic review and meta-analysis. *Acta Obstetricia et Gynecologica Scandinavica, 100*(7), 1186-1199. https://doi.org/10.1111/aogs.14109

Armstrong, M.I., Birnie-Lefcovitch, S. & Ungar, M.T. (2005). Pathways between social support, family well being, quality of parenting, and child resilience: What we know. *Journal of Child and Family Studies 14*(1), 269–281. https://doi.org/10.1007/s10826-005-5054-4

Aschbrenner, K. A., Bobak, C., Schneider, E. J., Naslund, J. A., Brunette, M. F., & O'Malley, A. J. (2018). Egocentric social networks and smoking among adults with serious mental illness. *Translational Behavioral Medicine, 8*(4), 531-539. https://doi.org/10.1093/tbm/ibx014

Ashraf, S., Shah, K., Vadukapuram, R., Shah, B., Jaiswal, S., Mansuri, Z., & Jain, S. (2023). Impact of paternal depression on child neurodevelopmental outcomes and disorders. *The Primary Care Companion for CNS Disorders, 25*(1), 45432. https://doi.org/10.4088/PCC.22r03303

Assari, S., & Lankarani, M. M. (2016). Association between stressful life events and depression: Intersection of race and gender. *Journal of Racial and Ethnic Health Disparities, 3*(1), 349-356. https://doi.org/10.1007/s40615-015-0160-5

Bäckström, C., Larsson, T., & Thorstensson, S. (2021). How partners of pregnant women use their social networks when preparing for childbirth and parenthood: a qualitative study.

Nordic Journal of Nursing Research, 41(1), 25-33. https://doi.org/10.1177/2057158520943379

Bailey, Z. D., Feldman, J. M., & Bassett, M. T. (2021). How structural racism works: Racist policies as a root cause of US racial health inequities. *New England Journal of Medicine, 384*(8), 768-773. https://doi.org/10.1056/NEJMms2025396

Bailey, Z. D., Krieger, N., Agénor, M., Graves, J., Linos, N., & Bassett, M. T. (2017). Structural racism and health inequities in the USA: Evidence and interventions. *The Lancet, 389*(10077), 1453-1463. https://doi.org/10.1016/S0140-6736(17)30569-X

Bailey, R. K., Mokonogho, J., & Kumar, A. (2019). Racial and ethnic differences in depression: Current perspectives. *Neuropsychiatric Disease and Treatment, 15*(1), 603-609. https://doi.org/10.2147/NDT.S128584

Bakermans-Kranenburg, M. J., Verhees, M. W., Lotz, A. M., Alyousefi-van Dijk, K., & van IJzendoorn, M. H. (2022). Is paternal oxytocin an oxymoron? Oxytocin, vasopressin, testosterone, oestradiol and cortisol in emerging fatherhood. *Philosophical Transactions of the Royal Society B: Biological Sciences, 377*(1858), 1-11. https://doi.org/10.1098/rstb.2021.0060

Bamishigbin, O. N., Dunkel Schetter, C., Guardino, C. M., Stanton, A. L., Schafer, P., Shalowitz, M., Lanzi, R. G., Thorp, J., Jr., Raju, T., & Community Child Health Network Eunice Kennedy Shriver National Institute of Child and Health Development. (2017). Risk, resilience, and depressive symptoms in low-income African American fathers. *Cultural Diversity and Ethnic Minority Psychology, 23*(1), 70–80. https://doi.org/10.1037/cdp0000088

Bates, J. E., Freeland, C. A. B., & Lounsbury, M. L. (1979). Measurement of infant difficultness. *Child Development, 50*(3), 794-803. https://doi.org/10.2307/1128946

Beck, C. T. (1996). A meta-analysis of the relationship between postpartum depression and infant temperament. *Nursing Research, 45*(4), 225-230.

Belsky, J. (1984). The determinants of parenting: A process model. *Child Development, 55*(1), 83-96. https://doi.org/10.2307/1129836

Boisjoly, J., Duncan, G. J., & Hofferth, S. (1995). Access to social capital. *Journal of Family Issues, 16*(5), 609-631. https://doi.org/10.1177/019251395016005006

Borgatti, S. P., Everett, M. G., Johnson, J. C., & Agneessens, F. (2022). *Analyzing Social Networks Using R.* SAGE Publications Inc.

Bornstein, M. H., Putnick, D. L., Gartstein, M. A., Hahn, C. S., Auestad, N., & O'Connor, D. L. (2015). Infant temperament: Stability by age, gender, birth order, term status, and socioeconomic status. *Child Development, 86*(3), 844-863. https://doi.org/10.1111/cdev.12367

Bradley, R., & Slade, P. (2011). A review of mental health problems in fathers following the birth of a child. *Journal of Reproductive and Infant Psychology, 29*(1), 19-42. https://doi.org/10.1080/02646838.2010.513047

Bronfenbrenner, U. (2001). Ecological models of human development. In M. Gauvain , & M. Cole (Editors), *Readings on the development of children* (3rd ed., pp. 3-8). New York: Worth Publishers.

Bronfenbrenner, U., & Morris, P. (2006). The bioecoloigical model of human development. In *Theoretical Models of Human Development* (pp. 793-828). Wiley.

Brown, G. L., McBride, B. A., Bost, K. K., & Shin, N. (2011). Parental involvement, child temperament, and parents' work hours: Differential relations for mothers and fathers. *Journal of Applied Developmental Psychology, 32*(6), 313-322. https://doi.org/10.1016/j.appdev.2011.08.004

Brown, G. L., Schoppe-Sullivan, S. J., Mangelsdorf, S. C., & Neff, C. (2010). Observed and reported supportive coparenting as predictors of infant-mother and infant-father attachment security. *Early Child Development and Care, 180*(1), 121-137.

Brown, T. A., Chorpita, B. F., & Barlow, D. H. (1998). Structural relationships among dimensions of the DSM-IV anxiety and mood disorders and dimensions of negative affect, positive affect, and autonomic arousal. *Journal of Abnormal Psychology, 107*(2), 179–192. https://doi.org/10.1037/0021-843X.107.2.179

Burchinal, M. R., Follmer, A., & Bryant, D. M. (1996). The relations of maternal social support and family structure with maternal responsiveness and child outcomes among African American families. *Developmental Psychology, 32*(6), 1073–1083. https://doi.org/10.1037/0012-1649.32.6.1073

Cabrera, N. J., Fitzgerald, H. E., Bradley, R. H., & Roggman, L. (2014). The ecology of father-child relationships: An expanded model. *Journal of Family Theory & Review, 6*(4), 336-354. https://doi.org/10.1111/jftr.12054

Cabrera, N. J., Volling, B. L., & Barr, R. (2018). Fathers are parents, too! Widening the lens on parenting for children's development. *Child Development Perspectives, 12*(3), 152-157. https://doi.org/10.1111/cdep.12275

Cameron, E. E., Sedov, I. D., & Tomfohr-Madsen, L. M. (2016). Prevalence of paternal depression in pregnancy and the postpartum: An updated meta-analysis. *Journal of Affective Disorders, 206*(1), 189-203. https://doi.org/10.1016/j.jad.2016.07.044

Carlson, M., McLanahan, S., & England, P. (2004). Union formation in fragile families. *Demography, 41*(1), 237-261. https://doi.org/10.1353/dem.2004.0012

Cavalhieri, K. E., & Wilcox, M. M. (2022). The compounded effects of classism and racism on mental health outcomes for African Americans. *Journal of Counseling Psychology, 69*(1), 111–120. https://doi.org/10.1037/cou0000561

Chhabra, J., McDermott, B., & Li, W. (2020). Risk factors for paternal perinatal depression and anxiety: A systematic review and meta-analysis. *Psychology of Men & Masculinities, 21*(4), 593–611. https://doi.org/10.1037/men0000259

Clark, L. A., & Watson, D. (1991). Tripartite model of anxiety and depression: psychometric evidence and taxonomic implications. *Journal of Abnormal Psychology, 100*(3), 316–336. https://doi.org/10.1037/0021-843X.100.3.316

Coleman-Kirumba, L. M., Cornish, M. A., Horton, A. J., & Alvarez, J. C. (2023). Experiences of Black men: Forms of masculinity and effects on psychological help-seeking variables. *Journal of Black Psychology, 49*(1), 32-57. https://doi.org/10.1177/00957984221098122

Crittenden, P. M. (1985). Social networks, quality of child rearing, and child development. *Child Development, 56*(5), 1299-1313. https://doi.org/10.2307/1130245

DeMontigny, F., Girard, M. E., Lacharité, C., Dubeau, D., & Devault, A. (2013). Psychosocial factors associated with paternal postnatal depression. *Journal of Affective Disorders, 150*(1), 44-49. https://doi.org/10.1016/j.jad.2013.01.048

Don, B. P., & Mickelson, K. D. (2012). Paternal postpartum depression: The role of maternal postpartum depression, spousal support, and relationship satisfaction. *Couple and Family Psychology: Research and Practice, 1*(4), 323–334. https://doi.org/10.1037/a0029148

Dressler, W. W. (1985). Extended family relationships, social support, and mental health in a southern black community. *Journal of Health and Social Behavior, 26*(1), 39-48. https://doi.org/10.2307/2136725

Dunbar, R. I. M. (1998). The social brain hypothesis. *Evolutionary Anthropology*, *6*(5), 178-190. https://doi.org/10.1002/(SICI)1520-6505(1998)6:5<178::AID-EVAN5>3.0.CO;2-8

Eddy, B., Poll, V., Whiting, J., & Clevesy, M. (2019). Forgotten fathers: Postpartum depression in men. *Journal of Family Issues, 40*(8), 1001-1017. https://doi.org/10.1177/0192513X19833111

Fagan, J., Palkovitz, R., Roy, K., & Farrie, D. (2009). Pathways to paternal engagement: longitudinal effects of risk and resilience on nonresident fathers. *Developmental Psychology*, *45*(5), 1389-1405.

Fagan, J., & Palkovitz, R. (2019). Coparenting and father engagement among low-income parents: Actor–partner interdependence model. *Journal of Family Psychology*, *33*(8), 894–904. https://doi.org/10.1037/fam0000563

Field, T. (2010). Postpartum depression effects on early interactions, parenting, and safety practices: a review. *Infant Behavior and Development*, *33*(1), 1-6. https://doi.org/10.1016/j.infbeh.2009.10.005

Field, T. (2018). Paternal prenatal, perinatal and postpartum depression: A narrative review. *Journal of Anxiety & Depression*, *1*(1), 1-16. https://www.yumedtext.com/files/publish/published-pdf--6-JAD-102.pdf

Figueiredo, B., Canário, C., Tendais, I., Pinto, T. M., Kenny, D. A., & Field, T. (2018). Couples' relationship affects mothers' and fathers' anxiety and depression trajectories over the transition to parenthood. *Journal of Affective Disorders*, *238*(1), 204-212. https://doi.org/10.1016/j.jad.2018.05.064

Fisher, S. D., Cobo, J., Figueiredo, B., Fletcher, R., Garfield, C. F., Hanley, J., ... & Singley, D. B. (2021). Expanding the international conversation with fathers' mental health: Toward

an era of inclusion in perinatal research and practice. *Archives of Women's Mental Health, 24*(5), 841-848. https://doi.org/10.1007/s00737-021-01171-y

Fletcher, R. J., Feeman, E., Garfield, C., & Vimpani, G. (2011). The effects of early paternal depression on children's development. *Medical Journal of Australia, 195*(11-12), 685-689. https://doi.org/10.5694/mja11.10192

Flouri, E., Narayanan, M. K., & Nærde, A. (2018). Stressful life events and depressive symptoms in mothers and fathers of young children. *Journal of Affective Disorders, 230*(1), 22-27. https://doi.org/10.1016/j.jad.2017.12.098

Freeman, L.C. (1979). Centrality in Social Networks I: Conceptual Clarification. *Social Networks, 1*(1), 215–239.

Frost, L. A. (1996). *Postpartum distress in fathers: Predicting depressive symptoms, anxiety, and anger at one month postpartum*. The University of Wisconsin-Madison.

Gavin, L. E., Black, M. M., Minor, S., Abel, Y., Papas, M. A., & Bentley, M. E. (2002). Young, disadvantaged fathers' involvement with their infants: An ecological perspective. *Journal of Adolescent Health, 31*(3), 266-276. https://doi.org/10.1016/S1054-139X(02)00366-X

Genesoni, L., & Tallandini, M. A. (2009). Men's psychological transition to fatherhood: An analysis of the literature, 1989–2008. *Birth, 36*(4), 305-318. https://doi.org/10.1111/j.1523-536X.2009.00358.x

Gentile, S., & Fusco, M. L. (2017). Untreated perinatal paternal depression: Effects on offspring. *Psychiatry Research, 252*(1), 325-332. https://doi.org/10.1016/j.psychres.2017.02.064

Gettler, L. T., McDade, T. W., Feranil, A. B., & Kuzawa, C. W. (2011). Longitudinal evidence that fatherhood decreases testosterone in human males. Proceedings of the National *Academy of Sciences, 108*(39), 16194-16199. https://doi.org/10.1073/pnas.1105403108

Geys, B., & Murdoch, Z. (2010). Measuring the 'bridging'versus 'bonding'nature of social networks: A proposal for integrating existing measures. *Sociology, 44*(3), 523-540. https://doi.org/10.1177/0038038510362474

Giano, Z., Ernst, C. W., Snider, K., Davis, A., O'Neil, A. M., & Hubach, R. D. (2021). ACE domains and depression: Investigating which specific domains are associated with depression in adulthood. *Child Abuse & Neglect, 122*(1), 105335. https://doi.org/10.1016/j.chiabu.2021.105335

Goodman, J. H. (2004). Paternal postpartum depression, its relationship to maternal postpartum depression, and implications for family health. *Journal of Advanced Nursing, 45*(1), 26-35. https://doi.org/10.1046/j.1365-2648.2003.02857.x

Gordon, I., Zagoory-Sharon, O., Leckman, J. F., & Feldman, R. (2010). Oxytocin and the development of parenting in humans. *Biological Psychiatry, 68*(4), 377-382. https://doi.org/10.1016/j.biopsych.2010.02.005

Green, B.L., Furrer, C. & McAllister, C. (2007). How do relationships support parenting? Effects of attachment style and social support on parenting behavior in an at-risk population. *American Journal of Community Psychology, 40*(1), 96-108. https://doi.org/10.1007/s10464-007-9127-y

Grigoriadis, S., Graves, L., Peer, M., Mamisashvili, L., Tomlinson, G., Vigod, S. N., ... & Richter, M. (2019). A systematic review and meta-analysis of the effects of antenatal anxiety on postpartum outcomes. *Archives of Women's Mental Health, 22*(1), 543-556. https://doi.org/10.1007/s00737-018-0930-2

Guintivano, J., Sullivan, P. F., Stuebe, A. M., Penders, T., Thorp, J., Rubinow, D. R., & Meltzer-Brody, S. (2018). Adverse life events, psychiatric history, and biological predictors of postpartum depression in an ethnically diverse sample of postpartum

women. *Psychological Medicine, 48*(7), 1190-1200. https://doi.org/10.1017/S0033291717002641

Gustavson, K., Røysamb, E., Soest, T. V., Helland, M. J., Karevold, E., & Mathiesen, K. S. (2012). Reciprocal longitudinal associations between depressive symptoms and romantic partners' synchronized view of relationship quality. *Journal of Social and Personal Relationships, 29*(6), 776-794. https://doi.org/10.1177/0265407512448264

Harrell, S. P. (2000). A multidimensional conceptualization of racism related stress: Implications for wellbeing of people of color. *American Journal of Orthopsychiatry, 70*(1), 42-57. https://doi.org/10.1037/h0087722

Henshaw, E. J., Cooper, M., Wood, T., N. Doan, S., Krishna, S., & Lockhart, M. (2023). Psychosocial predictors of early postpartum depressive and anxious symptoms in primiparous women and their partners. *BMC Pregnancy and Childbirth, 23*(1), 1-8. https://doi.org/10.1186/s12884-023-05506-8

Heshmati, A., Honkaniemi, H., & Juárez, S. P. (2023). The effect of parental leave on parents' mental health: a systematic review. *The Lancet Public Health, 8*(1), e57-e75. https://doi.org/10.1016/S2468-2667(22)00311-5

Hill, S. A. (2001). Class, race, and gender dimensions of child rearing in African American families. *Journal of Black Studies, 31*(4), 494-508. https://doi.org/10.1177/002193470103100407

Hill, R. A., & Dunbar, R. I. M. (2003). Social network size in humans. *Human Nature, 14*(1), 53-72. https://doi.org/10.1007/s12110-003-1016-y

Hoffmann, L., Hilger, N., Riolino, E., Lenz, A., & Banse, R. (2023). Partner support and relationship quality as potential resources for childbirth and the transition to

parenthood. *BMC Pregnancy and Childbirth, 23*(1), 435. https://doi.org/10.1186/s12884-023-05748-6

Hoffmann, J. P., & Shafer, K. (2015). Linear Regression Analysis: Assumptions and Applications. NASW Press.

Hudson, D. L., Neighbors, H. W., Geronimus, A. T., & Jackson, J. S. (2016). Racial discrimination, John Henryism, and depression among African Americans. *Journal of Black Psychology, 42*(3), 221-243. https://doi.org/10.1177/0095798414567757

Hunt, T. K., Caldwell, C. H., & Assari, S. (2015). Family economic stress, quality of paternal relationship, and depressive symptoms among African American adolescent fathers. *Journal of Child and Family Studies, 24*(1), 3067-3078. https://doi.org/10.1007/s10826-015-0112-z

Hunter, A. G., Chipenda-Dansokho, S., Tarver, S. Z., Herring, M., & Fletcher, A. (2019). Social capital, parenting, and African American families. *Journal of Child and Family Studies, 28*(1), 547-559. https://doi.org/10.1007/s10826-018-1282-2

Hunter, S. C., Riggs, D. W., & Augoustinos, M. (2017). Hegemonic masculinity versus a caring masculinity: Implications for understanding primary caregiving fathers. *Social and Personality Psychology Compass, 11*(3), e12307. https://doi.org/10.1111/spc3.12307

Huxhold, O., Fiori, K. L., & Windsor, T. D. (2013). The dynamic interplay of social network characteristics, subjective well-being, and health: The costs and benefits of socio-emotional selectivity. *Psychology and Aging, 28*(1), 3–16. https://doi.org/10.1037/a0030170

Jackson, G. L., Kennedy, D., Bradbury, T. N., & Karney, B. R. (2014). A social network comparison of low-income Black and White newlywed couples. *Journal of Marriage and Family, 76*(5), 967-982. https://doi.org/10.1111/jomf.12137

Julian, M., Le, H. N., Coussons-Read, M., Hobel, C. J., & Schetter, C. D. (2021). The moderating role of resilience resources in the association between stressful life events and symptoms of postpartum depression. *Journal of Affective Disorders, 293*(1), 261-267. https://doi.org/10.1016/j.jad.2021.05.082

Jung, K., Lim, D., & Shi, Y. (2014). Racial-ethnic disparities in use of antidepressants in private coverage: Implications for the Affordable Care Act. *Psychiatric Services, 65*(9), 1140-1146. https://doi.org/10.1176/appi.ps.201300182

Keller, M. C., Neale, M. C., & Kendler, K. S. (2007). Association of different adverse life events with distinct patterns of depressive symptoms. *American Journal of Psychiatry, 164*(10), 1521-1529. https://doi.org/10.1176/appi.ajp.2007.06091564

Kendler, K. S., Karkowski, L. M., & Prescott, C. A. (1999). Causal relationship between stressful life events and the onset of major depression. *American Journal of Psychiatry, 156*(6), 837-841. https://doi.org/10.1176/ajp.156.6.837

Kennedy, D. P., Bradbury, T. N., & Karney, B. R. (2023). Typologies of duocentric networks among low-income newlywed couples. *Network Science, 11*(4), 632-656. https://doi.org/10.1017/nws.2023.16

Kennedy, D. P., Jackson, G. L., Green, H. D., Bradbury, T. N., & Karney, B. R. (2015). The analysis of duocentric social networks: A primer. *Journal of Marriage and Family, 77*(1), 295-311. https://doi.org/10.1111/jomf.12151

Kim, H. K., & McKenry, P. C. (1998). Social networks and support: A comparison of African Americans, Asian Americans, Caucasians, and Hispanics. *Journal of Comparative Family Studies, 29*(2), 313-334. https://doi.org/10.3138/jcfs.29.2.313

Kim, P., & Swain, J. E. (2007). Sad dads: paternal postpartum depression. *Psychiatry (Edgmont), 4*(2), 35-47. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2922346/pdf/PE_4_2_36.pdf

Kingston, D., Tough, S., & Whitfield, H. (2012). Prenatal and postpartum maternal psychological distress and infant development: A systematic review. *Child Psychiatry & Human Development, 43*(1), 683-714. https://doi.org/10.1007/s10578-012-0291-4

Knoester, C., & Petts, R. J. (2017). Fathers' parenting stress after the arrival of a new child. *Family Relations, 66*(3), 367-382. https://doi.org/10.1111/fare.12263

Kowal, E., Gunthorpe, W., & Bailie, R. S. (2007). Measuring emotional and social wellbeing in Aboriginal and Torres Strait Islander populations: An analysis of a Negative Life Events Scale. *International Journal for Equity in Health, 6*(1), 1-12. https://doi.org/10.1186/1475-9276-6-18

Lam, J. A., Lu, B., Doogan, N. J., Thomson, T., Ferketich, A., Paskett, E. D., & Wewers, M. E. (2017). Depression, smoking, and ego-centric social network characteristics in Ohio Appalachian women. *Journal of Rural Mental Health, 41*(1), 30–41. https://doi.org/10.1037/rmh0000054

Latshaw, B. A., & Hale, S. I. (2015). 'The domestic handoff': Stay-at-home fathers' time-use in female breadwinner families. *Journal of Family Studies, 22*(2), 97-120. https://doi.org/10.1080/13229400.2015.1034157

Levant, R. F., & Wimer, D. J. (2009). The new fathering movement. In *Counseling Fathers* (pp. 3-21). Routledge.

Małus, A., Szyluk, J., Galińska-Skok, B., & Konarzewska, B. (2016). Incidence of postpartum depression and couple relationship quality. *Psychiatria Polska, 50*(6), 1135-1146. https://doi.org/10.12740/PP/61569

Marin, A., & Wellman, B. (2011). Social network analysis: An introduction. *The SAGE handbook of social network analysis*, 11-25.

McCarty, C. (2002). Structure in personal networks. *Journal of Social Structure, 3*(1). Retrieved from http://www.cmu.edu/joss/content/articles/volume3/McCarty.html

Mckenzie, S. K., & Carter, K. (2013). Does transition into parenthood lead to changes in mental health? Findings from three waves of a population based panel study. *Journal of Epidemiology and Community Health, 67*(4), 339-345. https://doi.org/10.1136/jech-2012-201765

McPherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a feather: Homophily in social networks. *Annual Review of Sociology, 27*(1), 415-444. https://doi.org/10.1146/annurev.soc.27.1.415

Miller, J. A. (2021). Examining the relationship between discrimination and depressive symptomatology in African American men: A literature review utilizing a metanarrative approach. *Journal of the American Psychiatric Nurses Association, 27*(2), 111-122. https://doi.org/10.1177/1078390320907680

Murillo, J. (2023). *The Effects of Racism on Levels of Stress in Fathers: Role of Coping and Sense of Control*. California State University, Long Beach.

Oldehinkel, A. J., Veenstra, R., Ormel, J., De Winter, A. F., & Verhulst, F. C. (2006). Temperament, parenting, and depressive symptoms in a population sample of preadolescents. *Journal of Child Psychology and Psychiatry, 47*(7), 684-695. https://doi.org/10.1111/j.1469-7610.2005.01535.x

Orr, S. T., Blazer, D. G., & James, S. A. (2006). Racial disparities in elevated prenatal depressive symptoms among Black and White women in eastern North Carolina. *Annals of Epidemiology, 16*(6), 463-468. https://doi.org/10.1016/j.annepidem.2005.08.004

Palkovitz, R. (2019). Expanding our focus from father involvement to father–child relationship quality. *Journal of Family Theory & Review, 11*(4), 576-591. https://doi.org/10.1111/jftr.12352

Palkovitz, R., & Hull, J. (2018). Toward a resource theory of fathering. *Journal of Family Theory & Review, 10*(1), 181–198. https://doi.org/10.1111/jftr.12239

Paulson, J. F., & Bazemore, S. D. (2010). Prenatal and postpartum depression in fathers and its association with maternal depression: A meta-analysis. *Journal of the American Medical Association, 303*(19), 1961-1969. doi:10.1001/jama.2010.605

Paulson, J. F., Bazemore, S. D., Goodman, J. H., & Leiferman, J. A. (2016). The course and interrelationship of maternal and paternal perinatal depression. *Archives of Women's Mental Health, 19*(1), 655-663. https://doi.org/10.1007/s00737-016-0598-4

Paulson, J. F., Dauber, S., & Leiferman, J. A. (2006). Individual and combined effects of postpartum depression in mothers and fathers on parenting behavior. *Pediatrics, 118*(2), 659-668. https://doi.org/10.1542/peds.2005-2948

Paulson, J. F., Dauber, S. E., & Leiferman, J. A. (2011). Parental depression, relationship quality, and nonresident father involvement with their infants. *Journal of Family Issues, 32*(4), 528-549. https://doi.org/10.1177/0192513X10388733

Pérez, F., Brahm, P., Riquelme, S., Rivera, C., Jaramillo, K., & Eickhorst, A. (2017). Paternal post-partum depression: How has it been assessed? A literature review. *Mental Health & Prevention, 7*(1), 28-36. https://doi.org/10.1016/j.mhp.2017.07.001

Perkins, J. M., Subramanian, S. V., & Christakis, N. A. (2015). Social networks and health: a systematic review of sociocentric network studies in low-and middle-income countries. *Social Science & Medicine, 125*(1), 60-78. https://doi.org/10.1016/j.socscimed.2014.08.019

Philpott, L. F. (2016). Paternal postnatal depression: An overview for primary healthcare professionals. *Primary Health Care, 26*(6), 23-27.

Plowden, K. O., Adams, L. T., & Wiley, D. (2016). Black and blue: Depression and African American men. *Archives of Psychiatric Nursing, 30*(5), 630-635. https://doi.org/10.1016/j.apnu.2016.04.007

Potnis, D., & Gala, B. (2020). Best practices for conducting fieldwork with marginalized communities. *Information Processing & Management, 57*(3), 102143-102156. https://doi.org/10.1016/j.ipm.2019.102144

R Core Team (2021). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.

Radloff, L. S. (1977). The CES-D Scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement, 1*(1), 385-401. https://doi.org/10.1177/014662167700100306

Reid, K. M., & Taylor, M. G. (2015). Social support, stress, and maternal postpartum depression: A comparison of supportive relationships. *Social Science Research, 54*(1), 246-262. https://doi.org/10.1016/j.ssresearch.2015.08.009

Rhode, J. L., Stricklin, S. M., & Nicely, S. (2018). Social network and emotional intelligence in pregnancy and postpartum. *Interpersona: An International Journal on Personal Relationships, 12*(2), 164-179. https://doi.org/10.5964/ijpr.v12i2.300

Rhodes, J. E., Ebert, L., & Fischer, K. (1992). Natural mentors: An overlooked resource in the social networks of young, African American mothers. *American Journal of Community Psychology, 20*(4), 445-461.

Rochlen, A. B., Suizzo, M.-A., McKelley, R. A., & Scaringi, V. (2008). “I'm just providing for my family”: A qualitative study of stay-at-home fathers. *Psychology of Men & Masculinity, 9*(4), 193–206. https://doi.org/10.1037/1524-9220.9.1.17

Rosenquist, J., Fowler, J. & Christakis, N. (2011) Social network determinants of depression. *Molecular Psychiatry 16*(1), 273–281. https://doi.org/10.1038/mp.2010.13

Rothbart, M. K., & Bates, J. E. (2007). Temperament. In N. Eisenberg, W. Damon, & R. M. Lerner (Eds), Handbook of Child Psychology: Sixth Edition (pp. 99-166). Wiley Inc.

Roubinov, D. S., Luecken, L. J., Crnic, K. A., & Gonzales, N. A. (2014). Postnatal depression in Mexican American fathers: Demographic, cultural, and familial predictors. *Journal of Affective Disorders, 152*(1), 360-368. https://doi.org/10.1016/j.jad.2013.09.038

Santini, Z. I., Koyanagi, A., Tyrovolas, S., Mason, C., & Haro, J. M. (2015). The association between social relationships and depression: A systematic review. *Journal of Affective Disorders, 175*(1), 53-65. https://doi.org/10.1016/j.jad.2014.12.049

Saxbe, D., & Martínez-García, M. (2024). Cortical volume reductions in men transitioning to first-time fatherhood reflect both parenting engagement and mental health risk. *Cerebral Cortex, 34*(4), bhae126. https://doi.org/10.1093/cercor/bhae126

Saxbe, D., Rossin-Slater, M., & Goldenberg, D. (2018). The transition to parenthood as a critical window for adult health. *American Psychologist, 73*(9), 1190-1200.

Scarff, J. R. (2019). Postpartum depression in men. *Innovations in Clinical Neuroscience, 16*(5-6), 11-14.

Schiller, C. E., Meltzer-Brody, S., & Rubinow, D. R. (2015). The role of reproductive hormones in postpartum depression. *CNS Spectrums, 20*(1), 48-59. https://doi.org/10.1017/S1092852914000480

Schoppe-Sullivan, S. J., Mangelsdorf, S. C., Brown, G. L., & Sokolowski, M. S. (2007). Goodness-of-fit in family context: Infant temperament, marital quality, and early coparenting behavior. *Infant Behavior and Development, 30*(1), 82-96. https://doi.org/10.1016/j.infbeh.2006.11.008

Scott, J. (2012). *What is social network analysis?* (pp. 57). Bloomsbury Academic.

Scott, J. (2017). *Social Network Analysis* (pp. 99). Sage.

Seefeld, L., Buyukcan-Tetik, A., & Garthus-Niegel, S. (2022). The transition to parenthood: perspectives of relationship science theories and methods. *Journal of Reproductive and Infant Psychology, 40*(2), 105-107. https://doi.org/10.1080/02646838.2022.2039864

Sinkewicz, M., & Lee, R. (2011). Prevalence, comorbidity, and course of depression among Black fathers in the United States. *Research on Social Work Practice, 21*(3), 289-297. https://doi.org/10.1177/1049731510386497

Short, S., Davis, P. E., & Ndzi, E. G. (2023). An exploration of masculinity, social support and depression in new and experienced fathers. *Midwifery, 123*(1), 103715. https://doi.org/10.1016/j.midw.2023.103715

Smith, K. P., & Christakis, N. A. (2008). Social networks and health. *Annual Review of Sociology, 34*(1), 405-429. https://doi.org/10.1146/annurev.soc.34.040507.134601

Solmeyer, A. R., & Feinberg, M. E. (2011). Mother and father adjustment during early parenthood: The roles of infant temperament and coparenting relationship quality. *Infant Behavior and Development, 34*(4), 504-514. https://doi.org/10.1016/j.infbeh.2011.07.006

StataCorp. 2017. *Stata Statistical Software: Release 15*. College Station, TX: StataCorp LLC.

Stevenson, H. C. (1998). Managing anger: Protective, proactive, or adaptive racial socialization identity profiles and African-American manhood development. *Journal of Prevention & Intervention in the Community, 16*(1-2), 35-61. https://doi.org/10.1300/J005v16n01_03

Surkan, P.J., Peterson, K.E., Hughes, M.D. et al. (2006) The Role of Social Networks and Support in Postpartum Women's Depression: A Multiethnic Urban Sample. *Maternal & Child Health Journal, 10*(1), 375–383. https://doi.org/10.1007/s10995-005-0056-9

Sutcliffe, A., Dunbar, R., Binder, J., & Arrow, H. (2012). Relationships and the social brain: integrating psychological and evolutionary perspectives. *British Journal of Psychology, 103*(2), 149-168. https://doi.org/10.1111/j.2044-8295.2011.02061.x

Sweeney, S., & MacBeth, A. (2016). The effects of paternal depression on child and adolescent outcomes: A systematic review. *Journal of Affective Disorders, 205*(1), 44-59. https://doi.org/10.1016/j.jad.2016.05.073

Tabassum, S., Pereira, F. S., Fernandes, S., & Gama, J. (2018). Social network analysis: An overview. *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery, 8*(5), e1256. https://doi.org/10.1002/widm.1256

Thoits, P. A. (2011). Mechanisms linking social ties and support to physical and mental health. *Journal of Health and Social Behavior, 52*(2), 145-161. https://doi.org/10.1177/0022146510395592

Thomas, C. R., Collins, C. C., Aytuglu, A., & Brown, G. L. (2024). Life stress and unmarried, Black fathers' attitudes toward attachment: The moderating role of shift-and-persist. *Psychology of Men & Masculinities, 25*(1), 27–32. https://doi.org/10.1037/men0000446

Torche, F., & Rauf, T. (2021). The transition to fatherhood and the health of men. *Journal of Marriage and Family, 83*(2), 446-465. https://doi.org/10.1111/jomf.12732

Trifu, S., Vladuti, A., & Popescu, A. (2019). The neuroendocrinological aspects of pregnancy and postpartum depression. Acta Endocrinologica (Bucharest), 15(3), 410-415.

Tully, L. A., Piotrowska, P. J., Collins, D. A., Frick, P. J., Anderson, V., Moul, C., ... & Dadds, M. R. (2018). Evaluation of 'The Father Effect'media campaign to increase awareness of,

and participation in, an online father-inclusive parenting program. *Health Communication, 34*(12), 1423-1432. https://doi.org/10.1080/10410236.2018.1495160

Ulvi, O., Karamehic-Muratovic, A., Baghbanzadeh, M., Bashir, A., Smith, J., & Haque, U. (2022). Social media use and mental health: A global analysis. *Epidemiologia, 3*(1), 11-25. https://doi.org/10.3390/epidemiologia3010002

Vilagut, G., Forero, C. G., Barbaglia, G., & Alonso, J. (2016). Screening for depression in the general population with the Center for Epidemiological Studies Depression (CES-D): A systematic review with meta-analysis. *PLoS ONE, 11*(1), e0155431. http://dx.doi.org/10.1371/journal.pone.0155431

Visser, P. L., Loess, P., Jeglic, E. L., & Hirsch, J. K. (2013). Hope as a moderator of negative life events and depressive symptoms in a diverse sample. *Stress and Health, 29*(1), 82-88. https://doi.org/10.1002/smi.2433

Volling, B. L., & Cabrera, N. J. (2019). Advancing research and measurement on fathering and child development: Introducing the issues and a conceptual framework. *Monographs of the Society for Research in Child Development, 84*(1), 7-17. https://doi.org/10.1111/mono.12404

Wang, D., Li, Y., Qui, D., & Xiao, S. (2021). Factors influencing paternal postpartum depression: A systematic review and meta-analysis. *Journal of Affective Disorders, 291*(1), 1-63. https://doi.org/10.1016/j.jad.2021.05.088

Ward, E., & Mengesha, M. (2013). Depression in African American men: A review of what we know and where we need to go from here. *American Journal of Orthopsychiatry, 83*(2pt3), 386-397. https://doi.org/10.1111/ajop.12015

Wasserman, S., & Faust, K. (1994). *Social network analysis: Methods and applications*. Cambridge University Press.

Watkins, D. C. (2012). Depression over the adult life course for African American men: Toward a framework for research and practice. *American Journal of Men's Health, 6*(3), 194-210. https://doi.org/10.1177/1557988311424072

Watkins, D. C., Green, B. L., Rivers, B. M., & Rowell, K. L. (2006). Depression and Black men: Implications for future research. *Journal of Men's Health and Gender, 3*(3), 227-235. http://doi.org/10.1016/j.jmhg.2006.02.005

Watkins, D. C., Johnson-Lawrence, V., & Griffith, D. M. (2011). Men and their father figures: Exploring racial and ethnic differences in mental health outcomes. *Race and Social Problems, 3*(1), 197-211. https://doi.org/10.1007/s12552-011-9051-5

Williams, D., & Perry, A. (2019). More than just incarceration: Law enforcement contact and Black fathers' familial relationships. *Race and Society, 8*(1), 85-118.

Witherington, D. C. (2007). The dynamic systems approach as metatheory for developmental psychology. *Human Development, 50*(2-3), 127-153. https://doi.org/10.1159/000100943

Youssef, N. A., Belew, D., Hao, G., Wang, X., Treiber, F. A., Stefanek, M., ... & Su, S. (2017). Racial/ethnic differences in the association of childhood adversities with depression and the role of resilience. *Journal of Affective Disorders, 208*(1), 577-581. https://doi.org/10.1016/j.jad.2016.10.024

Zhang, Y., & Razza, R. (2022). Father involvement, couple relationship quality, and maternal postpartum depression: the role of ethnicity among low-income families. *Maternal and Child Health Journal, 26*(7), 1424-1433. https://doi.org/10.1007/s10995-022-03407-4

Table 1

Descriptive Statistics

	M(n)	*SD*(%)	Min	Max
Covariates				
Age	28.32	6.58	18	51
Income	$1,894.10	$1,383.50	$0	$10,000
Education				
H.S. Diploma/GED[a]	(104)	(56%)	--	--
Vocational Certification	(22)	(12%)	--	--
Some College, No Degree	(45)	(24%)	--	--
Advanced College Degree	(15)	(8%)	--	--
Relationship with Child's Mother				
Steadily Romantically Involved[a]	(168)	(90%)	--	--
Other Relationship Status	(19)	(10%)	--	--
Pregnancy Planned				
Yes	(45)	(24%)	--	--
No[a]	(142)	(76%)	--	--
Contextual Risk Factors				
Depressive Symptoms	8.32	9.73	0	48
Negative Life Events	2.04	2.62	0	14
Relationship Quality	12.62	2.78	5	15
Temperamental Difficulty	2.27	.74	1	4.12
Experiences with Racism	6.35	6.55	0	27

Structural Network Characteristics				
Density	.84	.23	.08	1
Transitivity	.91	.14	.23	1

Note: [a]Designates the reference category.

Table 2

Bivariate Correlations

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Depressive Symptoms	--									
2. Negative Life Events	.16*	--								
3. Relationship Quality	-.35***	.07	--							
4. Temperamental Difficulty	-.13	-.07	-.14	--						
5. Experiences with Racism	.24**	.23**	-.05	-.10	--					
6. Density	-.18*	-.23**	-.03	.21**	-.04	--				
7. Transitivity	-.23**	-.21**	.04	.13	-.08	.87***	--			
8. Age	-.12	.01	-.02	-.05	-.06	.02	.08	--		
9. Income	.08	-.11	-.08	-.11	.06	-.02	-.04	.10	--	
10. Education	-.13	-.15*	.11	.08	-.15*	.10	.03	.07	.13	--

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

Table 3

Regression Including Only Demographic Covariates

	b	SE	β	*p*
Age	-.20	.11	-.14	.07
Income	.00	.00	.03	.66
Education	-79	.54	-.11	.14
Other Relationship Status	4.00	2.47	.12	.11
Planned Pregnancy	-.72	1.72	-.03	.68
R^2		.05		

Table 4

Regression Including Only Contextual Risk Factors

	b	SE	β	*p*
Negative Life Events	.63	.26	.18	.01
Relationship Quality	-1.11	.38	-.32	.00
Temperamental Difficulty	-1.74	.84	-.14	.04
Experiences with Racism	.15	.11	.10	.18
R^2		.16		

Table 5

Regression Including Social Network Density

	Step 1				Step 2			
	b	SE	β	*p*	b	SE	β	*p*
Negative Life Events	.63	.26	.18	.01	.59	.28	.16	.03
Relationship Quality	-1.11	.38	-.32	.00	-1.15	.26	-.33	.00
Temperamental Difficulty	-1.74	.84	-.14	.04	-1.23	.98	-.10	.21
Experiences with Racism	.15	.11	.10	.18	.20	.11	.13	.08
Density	--	--	--	--	-7.11	3.44	-.16	.04
ΔR^2	.16				.05			

Table 6

Regression Including Social Network Transitivity

	Step 1				Step 2			
	b	SE	β	*p*	b	SE	β	*p*
Negative Life Events	.63	.26	.18	.01	.59	.28	.16	.03
Relationship Quality	-1.11	.38	-.32	.00	-1.11	.26	-.32	.00
Temperamental Difficulty	-1.74	.84	-.14	.04	-1.31	.96	-.10	.17
Experiences with Racism	.15	.11	.10	.18	.18	.11	.12	.10
Transitivity	--	--	--	--	-15.05	6.08	-.18	.01
ΔR^2	.16				.06			

Table 7a

Negative Life Events Moderation Analyses Including Density

	Step 1				Step 2				Step 3			
	b	SE	β	*p*	b	SE	β	*p*	b	SE	β	*p*
Negative Life Events (NLE)	.63	.26	.18	.01	.59	.28	.16	.03	.57	.25	.15	.02
Relationship Quality	-1.11	.38	-.32	.00	-1.15	.26	-.33	.00	. -1.11	.40	-.32	.01
Temperamental Difficulty	-1.74	.84	-.14	.04	-1.23	.98	-.10	.21	-1.11	.96	-.09	.25
Experiences with Racism	.15	.11	.10	.18	.20	.11	.13	.08	.20	.11	.13	.08
Density	--	--	--	--	-7.11	3.44	-.16	.04	-8.40	3.54	-.21	.02
Density x NLE	--	--	--	--	--	--	--	--	.99	1.33	.06	.46
ΔR^2		.16				.05				.01		

Table 7b

Negative Life Events Moderation Analyses Including Transitivity

	Step 1				Step 2				Step 3			
	b	SE	β	*p*	b	SE	β	*p*	b	SE	β	*p*
Negative Life Events (NLE)	.63	.26	.18	.01	.59	.28	.16	.03	.56	.25	.15	.03
Relationship Quality	-1.11	.38	-.32	.00	-1.11	.26	-.32	.00	-1.03	.40	-.30	.01
Temperamental Difficulty	-1.74	.84	-.14	.04	-1.31	.96	-.10	.17	-1.22	.93	-.10	.19
Experiences with Racism	.15	.11	.10	.18	.18	.11	.12	.10	.19	.11	.12	.09
Transitivity	--	--	--	--	-15.05	6.08	-.18	.01	-16.51	5.24	-.26	.00
Transitivity x NLE	--	--	--	--	--	--	--	--	3.37	2.10	.12	.11
ΔR^2	.16				.06				.03			

Table 8a

Low Relationship Quality Moderation Analyses Including Density

	Step 1				Step 2				Step 3			
	b	SE	β	*p*	b	SE	β	*p*	b	SE	β	*p*
Negative Life Events	.63	.26	.18	.01	.59	.28	.16	.03	.59	.24	.16	.02
Relationship Quality	-1.11	.38	-.32	.00	-1.15	.26	-.33	.00	-1.06	.41	-.30	.01
Temperamental Difficulty	-1.74	.84	-.14	.04	-1.23	.98	-.10	.21	-1.19	.93	-.10	.20
Experiences with Racism	.15	.11	.10	.18	.20	.11	.13	.08	.17	.11	.11	.12
Density	--	--	--	--	-7.11	3.44	-.16	.04	-8.21	3.08	-.20	.01
Density x Relationship Quality	--	--	--	--	--	--	--	--	2.06	1.21	.16	.09
ΔR^2	.16				.05				.04			

Table 8b

Low Relationship Quality Moderation Analyses Including Transitivity

	Step 1				Step 2				Step 3			
	b	SE	β	*p*	b	SE	β	*p*	b	SE	β	*p*
Negative Life Events	.63	.26	.18	.01	.59	.28	.16	.03	.61	.24	.16	.01
Relationship Quality	-1.11	.38	-.32	.00	-1.11	.26	-.32	.00	-.96	.42	-.27	.02
Temperamental Difficulty	-1.74	.84	-.14	.04	-1.31	.96	-.10	.17	-1.35	.91	-.11	.14
Experiences with Racism	.15	.11	.10	.18	.18	.11	.12	.10	.14	.10	.09	.17
Transitivity	--	--	--	--	-15.05	6.08	-.18	.01	-11.75	3.77	-.19	.00
Transitivity x Relationship Quality	--	--	--	--	--	--	--	--	3.26	1.09	.19	.00
ΔR^2	.29				.06				.05			

Table 9a

Temperamental Difficulty Moderation Analyses Including Density

	Step 1				Step 2				Step 3			
	b	SE	β	*p*	b	SE	β	*p*	b	SE	β	*p*
Negative Life Events	.63	.26	.18	.01	.59	.28	.16	.03	.60	.25	.16	.02
Relationship Quality	-1.11	.38	-.32	.00	-1.15	.26	-.33	.00	-1.06	.38	-.30	.01
Temperamental Difficulty	-1.74	.84	-.14	.04	-1.23	.98	-.10	.21	-.84	.94	-.07	.37
Experiences with Racism	.15	.11	.10	.18	.20	.11	.13	.08	.14	.11	.09	.22
Density	--	--	--	--	-7.11	3.44	-.16	.04	-10.78	3.53	-.26	.00
Density x Temperamental Difficulty	--	--	--	--	--	--	--	--	-10.37	4.89	-.17	.03
ΔR^2	.16				.05				.04			

Table 9b

Temperamental Difficulty Moderation Analyses Including Transitivity

	Step 1				Step 2				Step 3			
	b	SE	β	*p*	b	SE	β	*p*	b	SE	β	*p*
Negative Life Events	.63	.26	.18	.01	.59	.28	.16	.03	.62	.25	.17	.01
Relationship Quality	-1.11	.38	-.32	.00	-1.11	.26	-.32	.00	-.99	.38	-.28	.01
Temperamental Difficulty	-1.74	.84	-.14	.04	-1.31	.96	-.10	.17	-.89	.90	-.07	.32
Experiences with Racism	.15	.11	.10	.18	.18	.11	.12	.10	.10	.11	.07	.34
Transitivity	--	--	--	--	-15.05	6.08	-.18	.01	-18.36	4.24	-.29	.00
Transitivity x Temperamental Difficulty	--	--	--	--	--	--	--	--	-19.20	5.05	-.21	.00
ΔR^2	.29				.06				.05			

Table 10a

Experiences with Racism Moderation Analyses Including Density

	Step 1				Step 2				Step 3			
	b	SE	β	*p*	b	SE	β	*p*	b	SE	β	*p*
Negative Life Events	.63	.26	.18	.01	.59	.28	.16	.03	.45	.24	.12	.07
Relationship Quality	-1.11	.38	-.32	.00	-1.15	.26	-.33	.00	-1.10	.38	-.32	.00
Temperamental Difficulty	-1.74	.84	-.14	.04	-1.23	.98	-.10	.21	-1.38	.97	-.11	.16
Experiences with Racism	.15	.11	.10	.18	.20	.11	.13	.08	.18	.11	.11	.10
Density	--	--	--	--	-7.11	3.44	-.16	.04	-7.95	3.21	-.20	.01
Density x Experiences with Racism	--	--	--	--	--	--	--	--	-.86	.47	-.13	.07
ΔR^2	.16				.05				.03			

Table 10b

Experiences with Racism Moderation Analyses Including Transitivity

	Step 1				Step 2				Step 3			
	b	SE	β	*p*	b	SE	β	*p*	b	SE	β	*p*
Negative Life Events	.63	.26	.18	.01	.59	.28	.16	.03	.52	.25	.14	.04
Relationship Quality	-1.11	.38	-.32	.00	-1.11	.26	-.32	.00	-1.04	.38	-.30	.01
Temperamental Difficulty	-1.74	.84	-.14	.04	-1.31	.96	-.10	.17	-1.54	.95	-.12	.11
Experiences with Racism	.15	.11	.10	.18	.18	.11	.12	.10	.17	.10	.11	.11
Transitivity	--	--	--	--	-15.05	6.08	-.18	.01	-12.31	4.67	-.20	.01
Transitivity x Experiences with Racism	--	--	--	--	--	--	--	--	-1.16	.74	-.11	.12
ΔR^2	.29				.06				.03			

Figure 1

Association Between Low Inter-Parental Relationship Quality and Paternal PPD Symptoms as a Function of Density

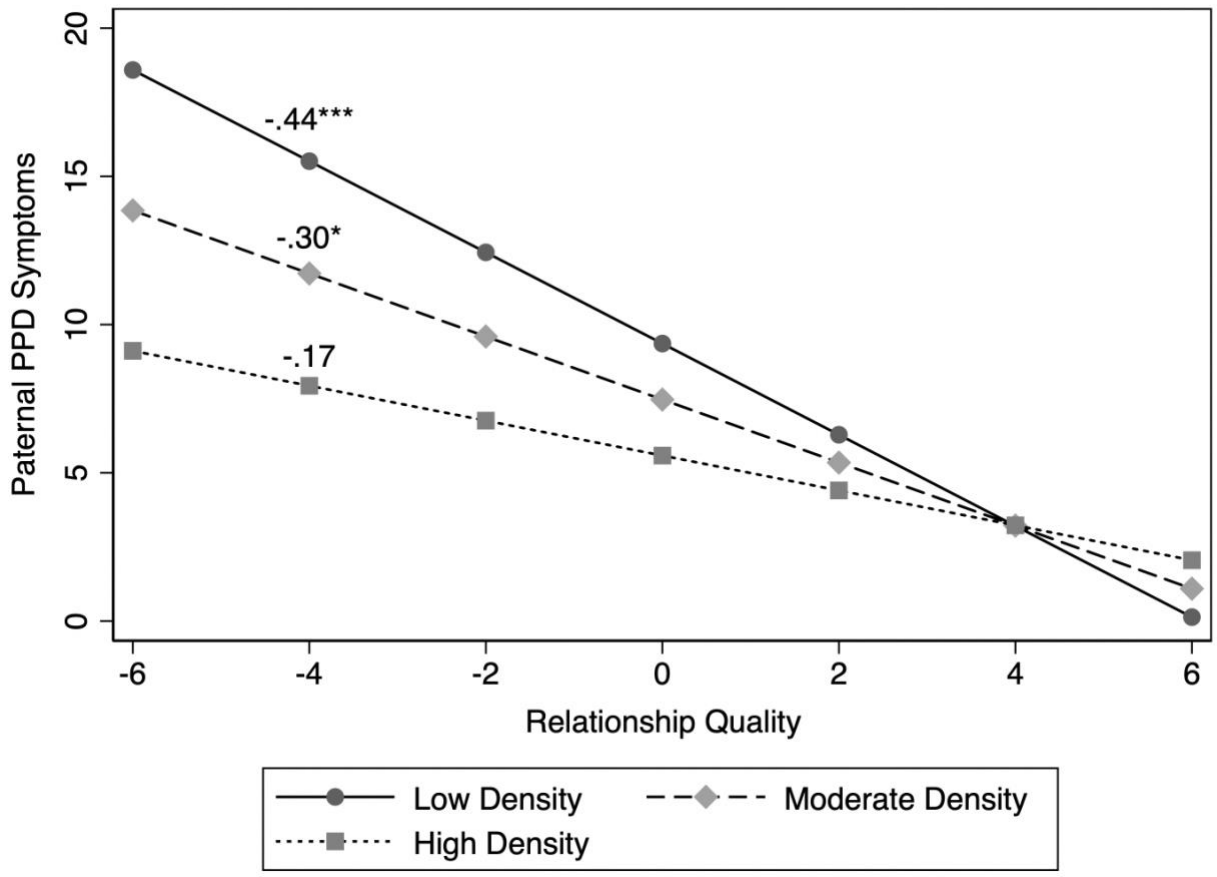


Figure 2

Association Between Low Inter-Parental Relationship Quality and Paternal PPD Symptoms as a Function of Transitivity

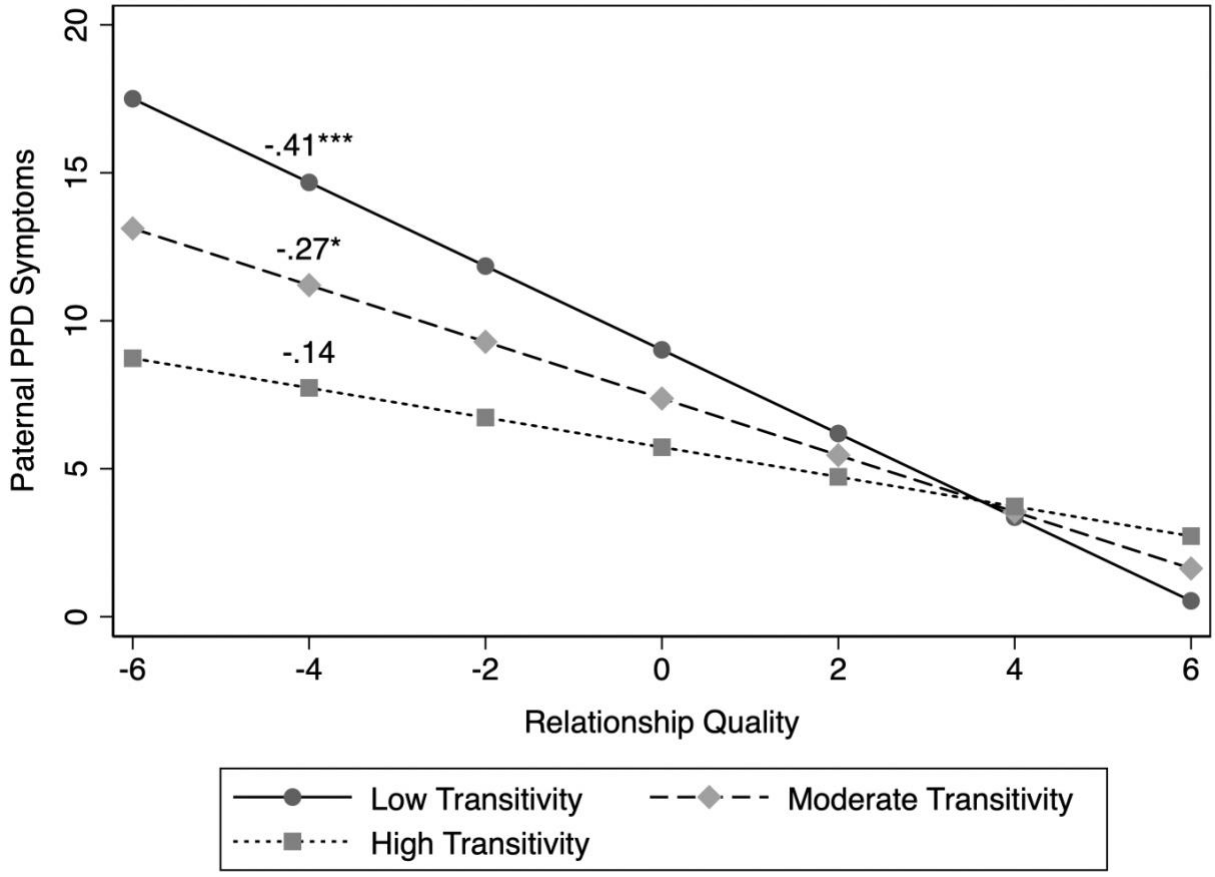


Figure 3

Association Between Temperamental Difficulty and Paternal PPD Symptoms as a Function of Density

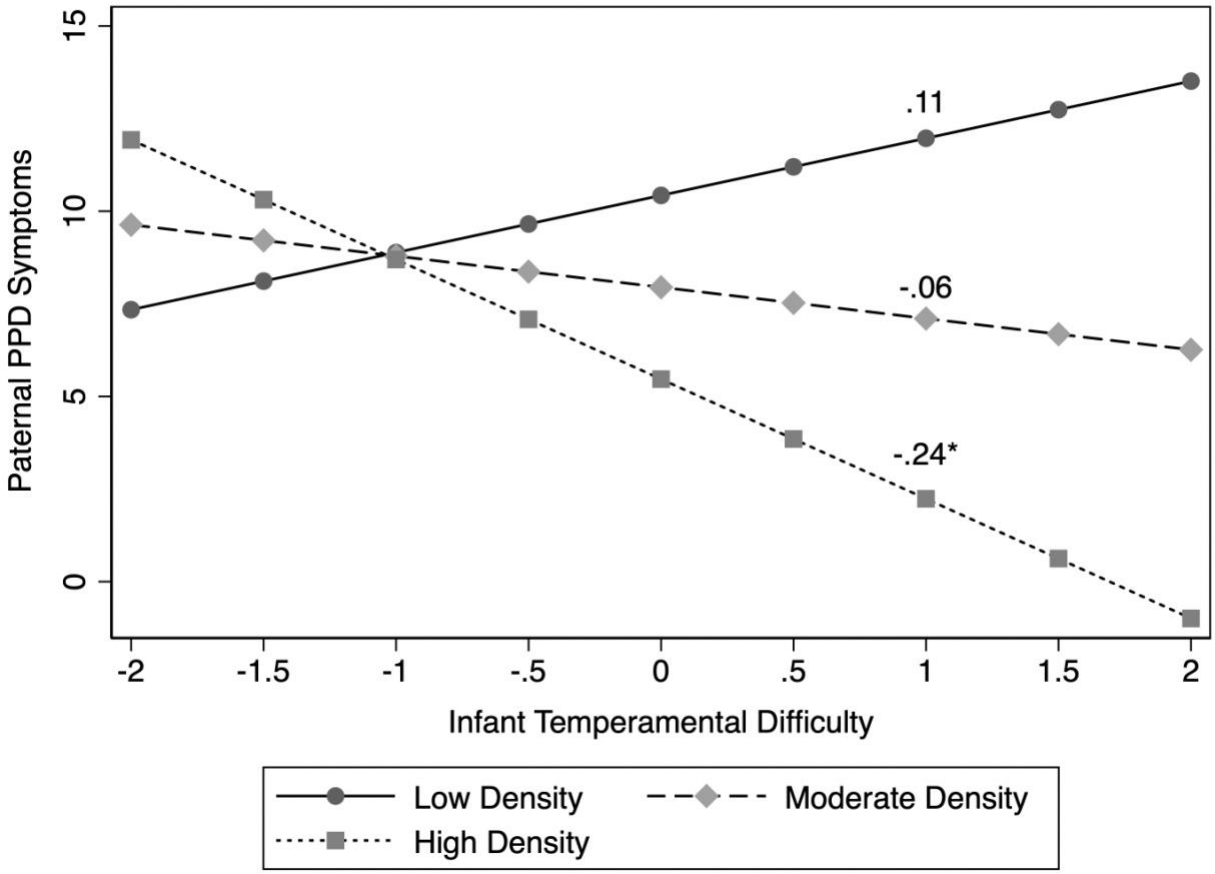


Figure 4

Association Between Temperamental Difficulty and Paternal PPD Symptoms as a Function of Transitivity

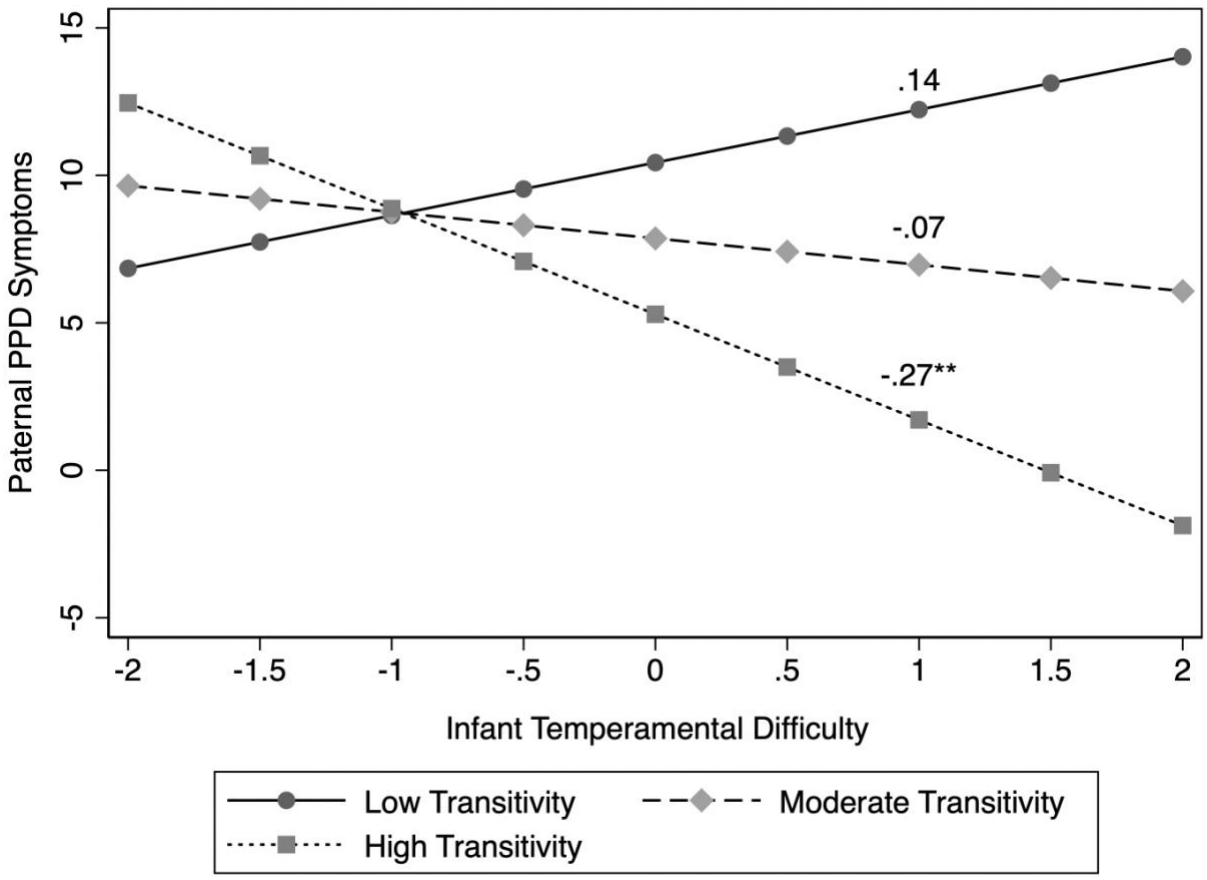
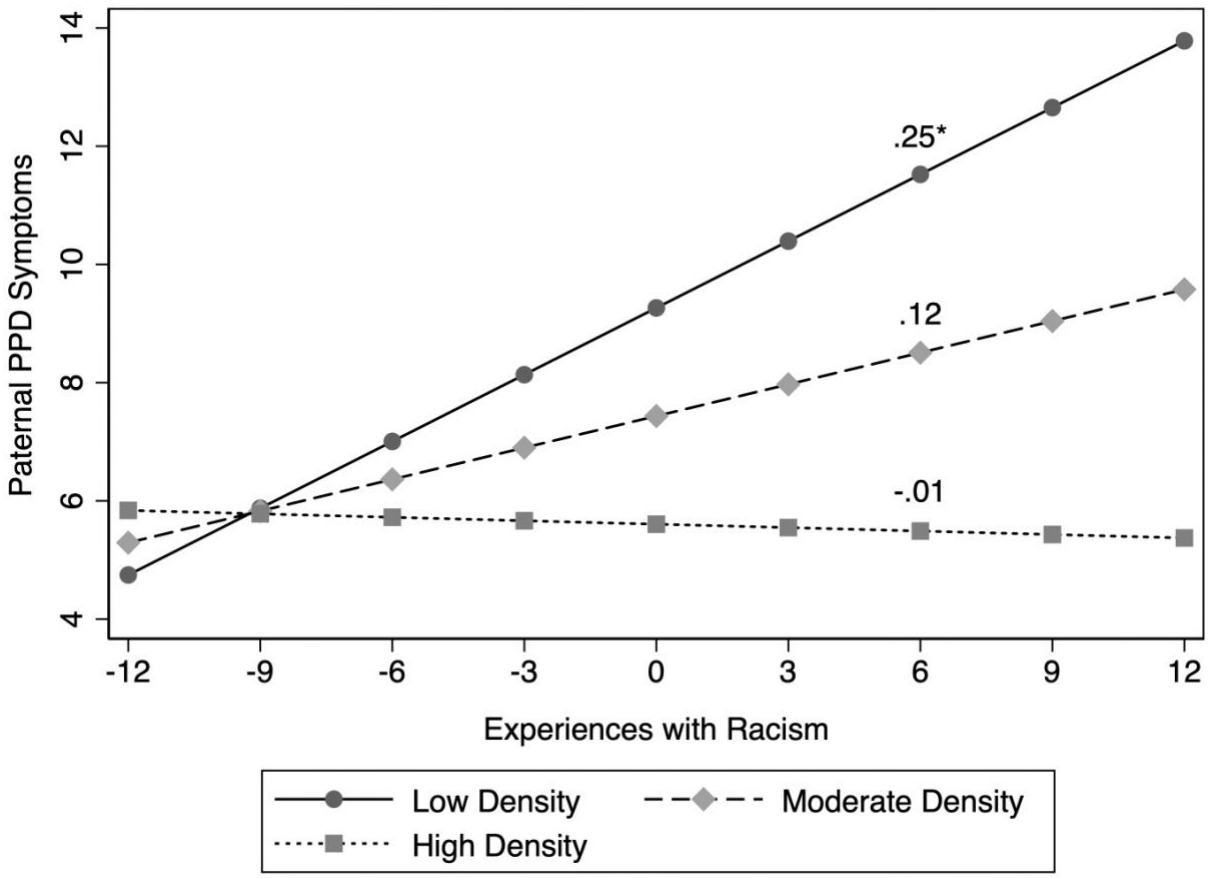


Figure 5

Association Between Experiences with Racism and Paternal PPD Symptoms as a Function of Density



Appendix

Depression Symptoms

CESD: CES-D Depression Scale

Intro: Below is a list of the ways you might have felt or behaved. Please indicate how often you have felt this way during the past week.

Response set:

0 = Rarely or none of the time (less than 1 day)

1 = Some or little of the time (1-2 days)

2 = Occasionally or a moderate amount of time (3-4 days)

3 = Most or all of the time (5-7) days

Items:

1. I was bothered by things that usually don't bother me.
2. I did not feel like eating; my appetite was poor.
3. I felt that I could not shake off the blues even with help from my family or friends.
4. I felt I was just as good as other people.
5. I had trouble keeping my mind on what I was doing.
6. I felt depressed.
7. I felt that everything I did was an effort.
8. I felt hopeful about the future.
9. I thought my life had been a failure.

10. I felt fearful.
11. My sleep was restless.
12. I was happy.
13. I talked less than usual.
14. I felt lonely.
15. People were unfriendly.
16. I enjoyed life.
17. I had crying spells.
18. I felt sad.
19. I felt that people dislike me.
20. I could not get “going.”

Scales:

CESTOT: Sum 1-3, 4r, 5-7, 8r, 9-11, 12r, 13-15, 16r, 17-20 (Depressive Symptoms)

Note: 2 suicide items not included

Negative Life Events

NLE: Negative Life Events

Intro: Here are some things that may happen in people's lives. Please read each one and indicate whether this happened for you *during the past year*.

Response set:

0	1
No	Yes

Items:

1. Did you have serious trouble with the police or the law?
2. Were you involved in a life-threatening accident?
3. Did you have any serious illness or injury?
4. Were you involved in a fire, flood or other natural disaster?
5. Did any close friend or close relative die?
6. Did you take on direct care of an ill or disabled parent or other relative?
7. Did a partner of yours have an unwanted pregnancy? Did you have an unwanted pregnancy?
8. Did a romantic partner of yours have a stillbirth or miscarriage? Did you have a stillbirth or miscarriage?
9. Did you have a close friend or relative with a serious illness or injury?
10. Did you have a steady, romantic relationship break up?
11. Did you have a long separation from a loved one or someone you're very close to?
12. Were you robbed or burglarized?

13. Did you have something valuable lost or stolen?

14. Were you seriously attacked or assaulted?

15. Did you witness someone being badly injured or killed?

Scales:

NLETOT: Sum 1-15 (Negative Life Events in the Last Year)

Low Inter-Parental Relationship Quality

RELQ: Relationship Quality

Intro: Please indicate what your current relationship with your child's mother/father is like, select the response that best reflects your opinion.

Response set 2:

1	2	3
Never	Sometimes	Often

2. How often is your child's mother/father fair and willing to compromise?
3. How often does your child's mother/father express love and affection for you?
4. How often does your child's mother/father encourage you or help you with things that are important to you?
5. How often does your child's mother/father listen to you when you need someone to talk to?
6. How often does your child's mother/father really understand your hurts and joys?

Scales:

RELSUP: Sum 2-6 (Supportiveness in Relationship with Other Parent)

Infant Temperamental Difficulty

TEM: Temperament (Infant Behavior Questionnaire)

Intro: On the following questions, please indicate the number that is most typical for (NAME OF CHILD). "About average" means how you think the typical baby would be scored.

Response set 1:

1	2	3	4	5	99
Very Easy		About Average		Difficult	I don't know

Items

TEM 1: How easy or difficult is it for you to calm or sooth [NAME OF CHILD] when [NAME OF CHILD] is upset?

Response sets:

TEM 5: How much does [NAME OF CHILD] cry and fuss?

1	2	3	4	5	99
Very little	Less than the average baby	About as much as the average baby	More than the average baby	Much more than the average baby	I don't know

TEM 9: How easily does [NAME OF CHILD] get upset?

1	2	3	4	5	99
Very hard to upset even by things that up most babies		About average		Very easily upset by things that would not bother most babies	I don't know

TEM 10: When [NAME OF CHILD] gets upset (e.g., before feeding, during diapering, etc.) how vigorously or loudly does [NAME OF CHILD] cry and fuss?

1	2	3	4	5	99
Very mild intensity or loudness		Moderate intensity or loudness		Very loud or intense, really cuts loose	I don't know

TEM 12: What kind of mood is [NAME OF CHILD] generally in?

1	2	3	4	5	99

Very happy and cheerful	Neither serious nor cheerful	Serious	I don't know

TEM 14: How often and how quickly does [NAME OF CHILD]'s mood change?

1	2	3	4	5	99
Changes seldom and changes slowly		About average		Changes often and rapidly	I don't know

TEM 16: Please rate the overall degree of difficult [NAME OF CHILD] would present for the average parent?

1	2	3	4	5	99
Super easy		Ordinary, some problems		Highly difficult	I don't know

Scale:

TEMDIF: Mean 1, 5, 9, 10, 12, 14, 16 (Fussy-Difficult Temperament)

Experiences with Racism

ERQ: Experiences with Racism Questionnaire

Intro: Below is a list of questions about negative experiences that may happen to Black/African American people because of their race.

Select the response that best reflects how often you have had these experiences in the past 6 months.

Response set:

0	1	2	3
Never	Once or Twice	A few times	Frequently

Items:

1. Have you been ignored, overlooked, or not given service because of your race?
2. Have you been treated rudely or disrespectfully because of your race?
3. Have you been blamed of something or treated suspiciously (as if you have done something or will do something wrong) because of your race?
4. Did others respond to you as if they were afraid because of your race?
5. Have you been watched or followed while in public because of your race?
6. Have you been treated as if you were stupid, or been talked to like you were slow because of your race?
7. Have your ideas or opinions been put down, ignored or belittled because of your race?
8. Have you heard or been told an offensive racist joke or comment?

9. Have you been called a name or harassed because of your race?

Scale:

ERQTOT: Sum 1-9 (Experiences with Racism)

Social Network Interviews

FOR INTERVIEWERS: Welcome to the PACT Wave 2 Father Social Network Interview. Please begin by entering the correct case ID on the next screen. Then complete the interview by reading the prompts and response choices on the screens that follow.

[ENTER CASE ID, e.g., PERSON1]

THIS IS THE CASE ID YOU ARE ABOUT TO START:

[PERSON1]

Is this the correct case id???? If not please press the "back" button and enter the correct case id. If correct click "next".

For this part of the study we want to understand more about the people in your life. This includes information about people that you know, your relationships with them, and their relationships with each other. This will help us understand more about social relationships for expecting parents such as yourself. The information you provide here is confidential, so please answer as honestly as possible.

I would like to ask you about the people you know and who know you. I will be asking you first to list people you know, then I will ask just a few questions about each of those people, and then I will ask about how those people know each other. I would like for you to start by naming 15 people. You can start with people who you know well and who know you well, but you can also name people that are less close to you.

Here's the kind of person we are hoping you will name:
--They should not be children under the age of 16.
--You should try to focus on people you have had at least some contact with sometime during the past year or so – either face-to-face, by phone, text, online, etc.
--These do not have to be people you like. They should be people you know and who know you well, but you can also name people that are less close to you.
The entire interview will take about 30 minutes. To get started, I'm going to ask you to name 15 people that you know and who know you.

INTERVIEW Starts:

First, please start by naming your child's mother, and after that you can name any other adults that you know. Please give us their first and last names. Remember, all of the information you give us is confidential.

[ENTER NAME OF MOTHER]
-After you typed, please click add. Double check that you entered your baby's mother. If correct click "Next" to continue

ALTER PROMPT

Now I'm going to ask you to name 14 more people. Remember that these are people you know and who know you, and they should be people that you've had some contact with in the past year or so. Please give us their first and last names.

INTERVIEWER: IF THEY ARE CONCERNED ABOUT GIVING LAST NAMES, Say, "We need to know last names so that we can distinguish between people who have the same first names. If you don't know the last name you can give me a nickname or a description."

INTERVIEWER: IF TWO ALTERS HAVE THE SAME FIRST AND LAST NAMES, ask for a nickname or some descriptive term.

INTERVIEWER: IF THE RESPONDENT IS HAVING TROUBLE NAMING 15 PEOPLE: It can be hard to come up with 15, we recognize that, but let me repeat what I said at the beginning that these do not have to be people you necessarily like, just people you know that you have contact with, either positive or negative. Think back to the places you have been in the past year or so, or think of the things you have done in the past year. Who was there? If you need to look at pictures, texts, or call history on your phone then you can do that.

You entered your baby's mother. Please enter 14 more names.

[ENTER NAMES OF 14 ALTERS: e.g., PERSON 2,3,4,5,6,7,8,9,10,11,12,13,14,15]

You have entered all 15 names. Please click next to continue.

SECOND ALTER

I would like for you to try to think of a few more people. When you think about having a baby, who are some other people who might be important in your relationship with your baby? They could be either helpful or harmful to you in raising your baby. Please name up to 5 more people that come to mind.

[ENTER NAMES OF 5 MORE PEOPLE]

Secondary Name Generator (After 15 names):

When you think about life with your baby, who are some other people who might be important in your relationship with your baby? They could be either helpful or harmful to you in raising your baby. Please name up to 5 more people that come to mind.

[ENTER NAMES OF 5 MORE ALTERS: e.g., PERSON 16 17 18 19 20]

You have entered all 5 names. Please click next to continue.

NON MOTHER INTRO

In this next part of the interview I am going to ask you some questions about all of the people you named. We are trying to understand more about the qualities and characteristics of important people in your life, and your relationships with those people.

Items:

INTERVIEWER: READ EACH NAME AND SELECT RESPONSE. DO NOT REQUEST "OTHER" RESPONSE. ONLY USE IF VOLUNTEERED.

SNI 1. Gender: Which of these people are men and which are women?
- Man
- Women
- Other
- Don't Know

[Please select 1 response for each individual (total 20 individual)]

SNI 2. Ethnicity: What race or ethnicity do each of these people identify with?
1=White
2=Black or African American
3=Hispanic
4=Asian
5=Other
0=Don't know

[Please select 1 to 5 responses for each individual]

SNI 3. Financial: How are each of these people doing financially? Would you say they are:
- Doing Well
- Getting By
- Struggling
- Don't know

[Please select 1 response for each individual (total 20 individual)]

Following question will be answered for each individual.

INTERVIEWER: SELECT ALL THAT APPLY.

SNI 4. How Know: How do you know **PERSON**? For example, is **PERSON** a family member, a member of [MOTHER's]'s family, your friend, friend of [MOTHER], your coworker, a neighbor, a current or former romantic partner, someone who provides you with a service, or something else?

- Own Family Member
- [MOTHER]'s Family Member
- Own Friend
- [MOTHER]'s Friend
- Co-worker
- Neighbor
- Romantic Partner
- [MOTHER]'S Romantic Partner
- Service Provider (e.g., Doctor, Childcare Provider, Mailman)
- OTHER SPECIFY
- Don't Know

SNI 5. **ONLY IF** 'Own Family Member', '[MOTHER]'s Family Member' **SELECTED, THEN** answer the following question: How is **PERSON** related to you? [Please select 1 response]

- OWN MOTHER/FATHER
- OWN STEP-PARENT
- OWN BROTHER/SISTER
- OWN BROTHER/SISTER'S PARTNER OR SPOUSE
- OWN AUNT/UNCLE
- OWN COUSIN
- OWN GRANDPARENT/GREAT GRANDPARENT
- OTHER RELATIVE OF MINE
- [EXPECTANT MOTHER]'S MOTHER/FATHER
- [EXPECTANT MOTHER]'S STEP-PARENT
- [EXPECTANT MOTHER]'S BROTHER/SISTER
- SPOUSE OR PARTNER OF [EXPECTANT MOTHER]'S BROTHER/SISTER
- [EXPECTANT MOTHER]'S AUNT/UNCLE
- [EXPECTANT MOTHER]'S COUSIN
- [EXPECTANT MOTHER]'S GRANDPARENT/GREAT GRANDPARENT
- OTHER RELATIVE OF EXPECTANT MOTHER
- OTHER
- Don't Know

SNI 6. How well: How well would you say that you know each of these people [please select 1 response for each individual]:

- Very well

- Fairly well
- Not well
- Don’t know
- Refuse

SNI 7. Contact: In the past year, how often have you had contact with each of these people either face-to-face, over the phone, emails, text messages, or communication via social media? [Please select 1 response for each individual]

- Every day
- A few times a week
- Once a week
- 2 or 3 times a month
- Once a month
- A few times a year
- Once a year
- Never
- Refuse

SNI 8. Relationship: How is your relationship with each of these people? Would you say [Please select 1 response for each individual]:

- Good
- Neutral
- Bad
- Refuse

COMMITED RELATIONSHIP

Now I’m going to ask you a series of questions for each person on your list. Answer as best you can even if you are not completely sure.

INTERVIEWER: READ EACH NAME AND SELECT "YES" IF THE RESPONDENT SAYS YES. IF THE RESPONDENT SAYS "NO" SELECT "NO".

SNI 9. Committed: Which of these people are currently in a committed relationship? A committed relationship is with someone like a consistent boyfriend or girlfriend, partner, significant other, or spouse. [Please select 1 response for each individual]

- Yes

- No
- I don’t know

SNI 10. Children 1: Which of these people have children? [Please select 1 response for each individual]
- Yes
- No
- I don’t know

Answer the following question **ONLY IF** they say ‘yes’ the question below.

SNI 11. Children 2: Which of these people have children under the age of 18?
- Yes
- No
- I don’t know

Answer the following question **ONLY IF** they say ‘yes’ to the question below.

SNI 12. Children 3: Which of these people live with any of their children that are under 18 years of age? Do they live with all of their children under 18, some of them, or none of them? [Please select 1 response for each individual.]
- Yes, lives with all of his/her children that are under 18
- Lives with some but not others
- No, does not live with any of his/her children under 18
- Don't Know

SNI 13. Children 4: How close would you say each of these people are to his/her children? [Please select 1 response for each individual.]
- Close
- Sort of close
- Not close
- Don’t know

CONCRETE SUPPORT

I am now going to ask you three questions about who you depend on when you need support.

INTERVIEWER: READ EACH NAME AND SELECT "YES" IF THE RESPONDENT SAYS YES. IF THE RESPONDENT SAYS "NO" SELECT "NO".

SNI 14. Support 1: Which of these people do you turn to when you need concrete support, such as money, transportation, food, or anything else you need? [Please select 1 response for each individual]
- Yes
- No

SNI 15. Support 2: Which of these people do you turn to when you need emotional support, like encouragement or someone to talk to about your feelings? [Please select 1 response for each individual]
- Yes
- No

SNI 16. Support 3: Which of these people do you turn to when you need help with your baby, like babysitting or parenting advice? [Please select 1 response for each individual]
- Yes
- No

SNI 17. For which of these people would you say religion, church, or spirituality is an important part of their life? [Please select 1 response for each individual]
- Yes
- No

STRUCT KNOW:

Thinking of the same 20 people I am now going to ask you about the people who have had contact with each other and how well you think they know each other. We are trying to understand how connected each of these people are to one another so that we can learn more about the people who are in the lives of new parents.

INTERVIEWER: Read each name pair. i.e., how well does PERSON 1 know [person a], how well does PERSON 1 know [person b], etc. Check appropriate box as the list continues. Following questions will be repeated for each pair.

SNI 18. How well do PERSON 1 and _____ know each other? Do they know each other:
Very well,
Fairly well
Not well,
Don't know each other

INTERVIEWER: read each name pair. i.e., what is relationship like between PERSON 1 and [person a], what is the relationship like between PERSON 10 and [person b], etc. Check appropriate box as the list continues. Following questions will be repeated for each pair shown in the list.

For these last questions I am going to ask you about the quality of the relationship between these pairs of people.

SNI 19. How is the relationship between PERSON 1 and _____? Would you say it is:
Good
Neutral
Bad

FINAL PAGE:

Thank you for all of those answers. They will help us to understand your social network. Sometimes people like to see a diagram of this network. Would you like to see a picture of your network based on the answers you just gave me?

.