Exploring the roles of support and neighborhood trust in modifying the association of parenthood and marital status with stress

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Introduction

The relationship between parenthood and health outcomes has been well documented in the past decade (Umberson and Williams 1999, Nomaguchi and Milkie 2003, Evenson and Simon 2005). Most of the previous research adopted the life course or psychological perspective to identify the social context where parenthood is associated with individual well-being (e.g., stress) (McLanahan and Adams 1987, Umberson et al. 2010). However, marital status, a crucial social context, has been commonly treated as a precondition for parenthood and not been fully considered as other individual characteristics (e.g., socioeconomic status, race/ethnicity, and gender). This study simultaneously considers both parenthood and marital status and explores how they are jointly associated with health. A growing literature (Williams 2003, Williams and Umberson 2004, Liu et al. 2009, Umberson et al. 2011, Umberson et al. 2010) has argued that marital status should be regarded as a crucial social context in individual's life course as other individual characteristics but how marital status and parenthood jointly affect health remains underexplored. This study aims to fill this gap.

Having a child (parenthood) is neither an equal experience for everyone, nor a simple cost-benefit question for individual well-being, especially mental health. Instead, the stress of parenthood seems to depend on different types of marital status. As childrearing requires long-term commitment and persistent efforts in order to maintain quality parenting, whether there is help to childbearing becomes a crucial determinant of the stress of parenthood. Empirical evidence suggested that having minor children at home was associated with high stress and this relationship varied little across types of marital status (McLanahan and Adams 1987, Ostberg and Hagekull 2000, Nomaguchi and Milkie 2003, Evenson and Simon 2005). However, a more important finding is that certain marital status groups suffer from childbearing and parenthood more than others. For example, unmarried women with children were found to be at a greater risk of poor health and more disadvantaged than those who are married with children or unmarried men with children (Mulsow et al. 2002, Copeland and Harbaugh 2005). Clearly, the synergy of long term experience of parenthood and

marital status leads to sophisticated life context that generate different levels of stress.

Parenthood is a status that is associated with many individual socioeconomic or demographic features (e.g., economic burden and social networking), and its impact on daily life may extend to residential choices, willingness to help people, receiving social support, and trust for neighbors (Sampson 1992, Furstenberg 1993, Sampson et al. 1997, Furstenberg 2001). Following this thought, it is reasonable to hypothesize that in contrast to those who are not parents, people in parenthood are more likely to seek the residential areas with strong sense of safety, support from and trust for neighbors. That is, parenthood involves in decision making process where environmental conditions or resources may outweigh other factors (Furstenberg 1993, Ross and Jang 2000, Browning and Cagney 2002). However, it is not clear from the existing literature whether parents living in a disadvantaged neighborhood have poor perceptions of support and trust. Even less is known about whether these perceptions interact with residential social environment conditions to influence health. The goals of this study are to examine whether raising children in a socioeconomically disadvantaged (e.g., high poverty and unemployment) and unstable (e.g., more turnovers) environment, exacerbates stress level and to investigate whether (and how) neighbor's willingness to help, neighborhood trust, and belongingness modify the influences of neighborhood environmental factors on the level of parental stress.

This study is important for family health and policy implication for the following reasons. First, the traditional approach to the impacts of parenthood and marital status on health is to discuss these two factors separately. This study endeavors to combine these two factors in order to better understand their combined associations with individual's stress level. The second contribution is to examine how neighborhood environmental factors are associated with parents' stress and, more specifically, whether residential social conditions and parents' perceptions of neighborhood are jointly related to stress. A multilevel analysis where both neighborhood and individual predictors are included may shed new light on the relationship between parents' mental health and the determinants beyond individual level.

Background

Parenthood, marital status and stress

Families are the primary institution for raising children, and family experience and environment not only influence adults' health but also shape children's life chances. Given recent increases in the change of family formation (McLanahan and Percheski 2008), the single-parent families, especially for mothers, are pronounced to be the most disadvantaged groups among family setting (Avison et al. 2008, Cooper et al. 2009). Moreover, the composition of single-parent families has also changed over time. The concentrated single-parent families has shifted dramatically, from widowed mothers to divorced mother and most recently, never married mothers (David and Jencks 2004, Western et al. 2008). These changes may inform health consequences of parenthood. Family researchers have the following agreements: (1) parents of minor children exhibit higher levels of psychological burden than do nonparents and parents of adult children (Hughes 1989, Umberson et al. 2010); (2) parenthood cause psychological issues, especially for women (Simon 1992, Bird 1997, Mirowsky and Schieman 2008); and (3) single mothers have higher levels of psychological distress than do married mothers (Kotchick et al. 2005, Avison et al. 2008). What we learn from these agreements is that the association between parenthood and stress depends on children's age and that marital status and parenthood may converge at some point in lifetime and create a social context that increases individual stress. Most previous research employed either marital resources model or the stress model (also referred to as "crisis" model) to explain the health disparity across social groups. Nonetheless, limited knowledge is generated on whether the combination of parenthood and marital status is one of the sources that contribute to social health disparity.

Few studies combined marital status and parenthood to explore their combined effect on individual's stress. The majority of previous research on parental stress was built on traditional life course perspective which emphasized how the experiences of transition to parenthood, marital dissolution, minor versus adult status of the child and the quality of relationship affect parental stress (Simon 1997, Nomaguchi and Milkie

2003, Williams and Umberson 2004, DeGarmo et al. 2008). It is often concluded that the absent of economic, psychological resources and social support, and the strains of time and social role on parenthood increase parental stress. One shared limitation among the earlier studies is to overlook the social structures where people are embedded (e.g., neighborhood), and this shortcoming may disguise important pathways toward a thorough understanding of parental stress

Parental stress is more salient for some people with certain types of marital status than others (Ensel et al. 1996, Williams and Umberson 2004). Parenthood is usually, if not always, a life-long experience that one person devotes him/herself to the family and children. While it is important to resolve the causal relationships between the stress of parenthood and other factors (e.g., marital status), what is more important is to first investigate what the determinants of parental stress are. We argue that these determinants may interact with one another and this study attempts to identify the context that amplifies parental stress most (Ross et al. 1990). Health disparities may be the consequences of consolidating individual's lack of resources or hardships into social statuses and healthy disparities, in turn, may expose individuals to structural disadvantages throughout lifetime. Identifying the important social context would help to narrow the health gaps between social groups.

Perceptions of neighborhood as stress moderators

Stress process has been argued to be involved in stressors (causing stress) and moderators (reducing or exacerbating stress) (Pearlin 1989). As discussed previously, the combinations of parenthood and marital status may be regarded as a major stressor. In this study, we first identify parents' perceptions of neighborhood as moderators that attenuate stress. We divided perceptions of neighborhood into three dimensions: perceived neighbor's willingness to help, neighborhood trust, and belongingness. Recently, subjective perceptions of neighborhood received more and more attention in understanding the relationship between people and place (Bates 2006, Kim and Ross 2009). Including subjective perceptions of neighborhood would help researchers to find clear evidence for neighborhood effects that are beyond individual level (e.g.,

social and built environment) because it further controls the individual differences in defining neighborhood and social interactions (Thoits 2010). The three dimensions of perceptions of neighborhood have been linked to minimize stress. Below we will elaborate on why these dimensions could reduce the associations between stress and parenthood/marital status.

Neighbor's willingness to help: The mental health outcomes of parents, such as stress, depression, and anxiety, have been found to be significantly related to the help from neighbors (Logan and Spitze 1994). The informal social ties with neighbors have been found to reduce fear and mistrust among people. Hence, having help or perceiving the willingness to help from neighbors could be viewed as strong informal social resources, ties, and support (Ross and Jang 2000) and these interpersonal relationships may be converted into both invisible and/or tangible resources that attenuate parental stress. For example, if neighbors can look after children after class when parents are not available, the day-today stress from this source would be minimized. While this argument has been applied to the literature, the beneficial effect of perception of neighbor's wiliness to help has not been formally incorporated into parental stress research.

Neighborhood trust: Trust is the foundation of productive social capital. According to Coleman (1990) "trust involves putting resources in the hands of parties who will use them to their own benefit (trustee), to the trustor's benefit, or both." Trust may be involved in explicit exchanges or broad sense of trustworthiness. The sense of trustworthiness is also the foundation of building social capital and, closure networking within and embedded community in the neighborhood. To build social capital, individuals must be involved with other people, formally or informally. Trusting individuals expect that they can depend on others, they believe in the integrity of other people, and they have faith and confidence in those around them (Ross et al. 2001, Usher 2007, Ross and Mirowsky 2009). The mutual trust within a neighborhood has been found to be associated with human health (Kawachi et al.

1997) and help individuals to improve mental health (Mckenzie et al. 2006).

Neighborhood belongingness: Sense of belongingness is a measure of neighborhood attachment and can be used to understand the relationship between neighborhood and individuals. Following Sarason (1974), we define belongingness as "the perception of similarity to others, an acknowledged interdependence with others, a willingness to maintain this interdependence and the feeling that one is part of a larger dependable and stable structure. Stronger sense of belongingness to a neighborhood can be hence translated into better perceptions of stability, familiarity, security and a general sense of well-being in a neighborhood. These features associated with belongingness have been found to contribute to social capital among individuals and imposed a positive effect on mental health (Song et al. 2010). Research on community attachment has provided evidence that longer residence is related to the increases in local social ties and positively associated with sense of community attachment (Liu et al. 1998, Sampson 1988, Flaherty and Brown 2010). A strong sense of belongingness and connectedness may correlate with abundant sources of social support for parents to manage and build social capital between and among persons.

Social capital is clearly the central concept related to the three subjective perceptions of neighborhood above, since perceiving the willingness to help from neighbors, trusting neighbors, and feeling attached to the neighborhood are all the symbols of reciprocity and mutuality of a group. The literature has suggested that strong neighborhood perception of trust, attachment and willingness to help all reduce the impacts of stressors (Lin et al. 1986, Lin and Ensel 1989, Furstenberg 1993, Ross and Jang 2000). Coupled with the well-known beneficial effects of social capital, the broad concept of these subjective perceptions, on human health (Kawachi et al. 1997, Song et al. 2010), this study argues that the perceptions of neighborhood would moderate the negative association between stress and parenthood/marital status.

Residential social conditions as stress moderators

Parenthood, as a long-term commitment, could play a crucial role in choosing residence. The neighborhoods where children are better protected and parents' responsibilities for offspring are less likely to be compromised would provide parents fewer stressors. When parents could not make home a safe place and fail the role of caretaker, their level of stress increases (Wandersman and Nation 1998, Kruger et al. 2007, Small and Newman 2001). Parents are the major caretakers, managers, and supervisors in their families (Furstenberg 1993, Furstenberg 2001) and when selecting residence they are more likely to account for the resources, information, and public facilities in the neighborhood than non-parents (Furstenberg 1995, Sampson 1992). It should be noted that parents' decision making process is not only for their offspring but also for parents themselves. For example, living in a neighborhood with few crimes may facilitate interpersonal relationships, help parents to raise children, and in turn reduce parental stress. That being said, parental stress could be treated as a function of residential conditions. While several recent studies examined the impacts of neighborhood environmental factors on maternal distress, depression, and parenting behaviors (Jackson 2000, Mulsow et al. 2002, Ceballo and McLoyd 2002, Christie-Mizell et al. 2003, Cooper et al. 2009, Guterman et al. 2009, Osborne et al. 2009), they were only focused on the mothers with minor children and did not consider neighborhood level factors as stress moderators. However, the literature still offered some preliminary evidence that leads us to argue that residential stability and the socioeconomic status (SES) of neighborhood are two fundamental factors related to parental stress.

Residential stability has been found to alleviate stress (Schieman 2009). Living in a stable neighborhood is good for residents' interaction, facilities the development of social capital, and strengthens levels of civil engagement over time (Boardman 2004). Several studies using data from Philadelphia suggested that residential stability has both direct and moderating effects on self-rated stress and the major explanation for the findings was drawn from the concept of social capital (Yang and Matthews

2010, Yang et al. 2010). The quantity and quality of social capital available for families within a neighborhood largely depend on the stability of local communities and the closure of social network (Coleman 1990, Sampson 1992). The lack of residential stability decreases the formation of durable social connection as residents are not likely to invest and remain in a community given the short period of staying there. Without durable social connections or ties, therefore, the resources that can be used to buffer stress would be limited and individual stress would be increased.

The neighborhood level SES are also associated with access to resources that reduce stress (Brooks-Gunn et al. 1993, Fischer and Kmec 2004), improve health outcome (Browning and Cagney 2002, Stockdale et al. 2007) and facilitate parents' well-being(Ceballo and McLoyd 2002). Better neighborhood SES has been found to have better access to public services than the neighborhood with poor SES, such as hospitals and schools. The families living in a better off neighborhood would, hence, more easily obtain help with respect to parenting skills and/or childcare than their counterparts in other neighborhood. For example, Pinderhughes (2001) found that living in higher neighborhood SES increases parental ability to transmit some their resources into positive educational outcomes for their children. Similarly, Brooks-Gunn et al (1993) highlighted neighborhood SES provides more information for parents to facilitate family moving and children schooling decision. Another explanation for why neighborhood SES could be regarded as a moderator of parental stress is that poor SES is generally defined as concentrated poverty and other associated social features (e.g., high unemployment and crime). These social indicators have been concluded to undermine the functions of social organizations and collectively hinder the ability to control and regulate conventional behaviors among residents. In addition, the parents in such neighborhood are more likely to suffer from economic hardship and have insufficient support to raise children. Likewise, dangerous neighborhood (i.e., high crime rates) has directly impacted children's life chances and increased parental stress with fear, mistrust, and the lack of sense of

safety (Simons et al. 1997, Ross and Mirowsky 2001, Ross et al. 2001).

Residential conditions and perceptions of neighborhood

In addition to exploring the direct impacts of the moderators above, we also investigate whether subjective perceptions of neighborhood and residential conditions jointly affect parental stress. There is a growing interest in the question of how neighborhood factors get under the skin (Taylor and Repetti 1997) and the interaction effects between individual and neighborhood variables on health outcomes have provided a plausible answer (Boardman 2004, Yang and Matthews 2010, Yang et al. 2010). Previous research has shown that poor neighborhood level SES was associated with poor perceptions of neighbor's willingness to help, neighborhood trust and belongingness, and, in turn, moderate the relationships between social support and parenting behaviors (Ceballo and McLoyd 2002). Specific to this study, we anticipate that the association between subjective perceptions of neighborhood and parental stress would also be a function of residential conditions. Given the fact that not all parents are able to live in their ideal neighborhood, it would be naive to assume that their stress would not vary across neighborhood. As Veronique and Douglas (2007) suggested, the buffering effect of moderators differed by the extent of neighborhood disorder and crime rates, and individual's ability to manage stressors and access resources is conditional on the neighborhood SES level.

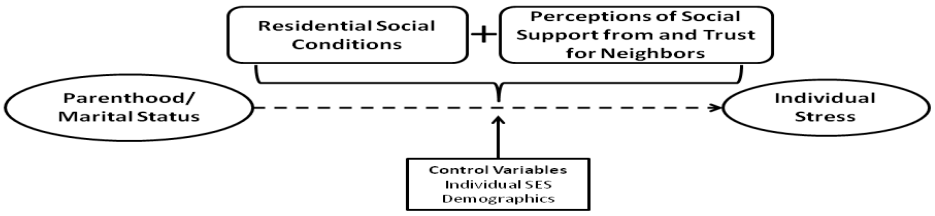
Research Question, Framework and Hypotheses

Based on the discussion above, the research framework of this study was presented in Figure 1 and it leads us to answer the following interrelated questions. We aim to first answer whether individual stress level differs by the parenthood/marital status combinations (dashed line) after controlling for other personal socioeconomic and demographic characteristics. In addition, the question of whether individual perceptions of social support from and trust for neighbors attenuate the associations between stress and parenthood/marital status is investigated. Finally, we include residential social conditions in the framework to explore how they interact with individual neighborhood perceptions to account for the relationships

between stress and parenthood/marital status.

Deriving from the literature review and framework, we propose the following research hypotheses. At individual level, after accounting for other personal characteristics, we anticipate that (H1) stress differs significantly by the parenthood/marital status combinations, and (H2) residents with better perceptions of neighborhood (neighbor's willingness to help, neighborhood trust, and belongingness) are more likely to report lower stress. At neighborhood level, we hypothesize that (H3) stress varies significantly by neighborhood, and (H4) better SES and more stable neighborhood environment are associated with lower stress. As for the interaction between individual and neighborhood covariates, we envision that (H5) the beneficial effects of subjective perceptions of neighborhood on stress are more profound in the neighborhood with better SES or higher residential stability.

Figure 1: Research Framework



Data

The 2008 Philadelphia Health Management Corporation's (PHMC) Household Health Survey is the source of our individual level data. The 2008 PHMC was conducted in a five-county area in southeast Pennsylvania (PHMC 2008) and contained respondent's information on health behaviours, health care experience, and personal social interactions. All participants were interviewed in English or Spanish by telephone and the PHMC employed a random-digit dial methodology and a stratified sampling frame to ensure the representativeness of the population in survey area (PHMC 2008). This study is based on 8,376 participants whose parenthood and

marital status were determined and embedded in 952 neighbourhoods. It should be noted that the 2008 PHMC survey has been found to closely match other data sources such as Behavioral Risk Factor Surveillance System (BRFSS) and the American Community Survey (ACS) and the data quality has been proven elsewhere (Yang et al. 2011).

Measures

Individual level

The level of stress is our primary outcome variable in our analysis. Using a scale from 1 to 10, where 1 means "no stress" and 10 means "an extreme amount of stress". The respondents were asked to answer the question of "How much stress would you say you have experienced during the past year". Subjective self-rated stress, are believed to better capture the combination of environmental demands and coping ability than a set of stressful events, reflecting the day-to-day stress(Lazarus 1990, Yang and Matthews 2010). We used logarithm to transform the original scale in order to have a distribution that is closer to Gaussian distribution.

Parenthood / marital Status. We defined parenthood as having minor (under 18) children at home (versus not) and categorized marital status into three groups: married with partner presence (labeled as married), married without partner presence (widowed, separated, or divorced, labeled as WSD), and single. Combining these two features, we created the following six parenthood/marital status combinations – married minor children, married without minor children, WSD with minor children, WSD without minor children, single with minor children, and single without minor children. We use those who are married without minor children at home as the reference group.

Economic Difficulty was measured as the mean response to the question: "How difficult was it for you to afford your housing costs during the past year?" ranking from 1(not difficult at all) to 4 (very difficult).

Perceived willing to help from neighbors was measured based on the answer to the question of "how likely people in your neighborhood are willing to help their

neighbors with routine activities such as picking up their trash cans, or helping to shovel snow." The scale ranges from 1 to 5 and higher number incidates stronger perceived willingness. *Perceived neighborhood belongingness* was measured with a scale from 1 to 4. Respondents rated their belongingness by answering how huch they agreed that ‘‘I feel that I belong and am a part of my neighborhood.’’ Higher number represents higher belongingness. Similarly, *perceived neighborhood trust* was measured based on with individual's rating to that ‘‘most people in the neighborhood can be trusted, ’’ with 1 indicating strongly disagree and 4 being strongly agree.

Other socio-demographic covariates. We include measures of gender (female=1, male=0), race (3 categories: Non-Hispanic white; Non-Hispanic black; Hispanic and others [reference group]), age, three level of educational attainment (less than high school, high school graduate, some college graduate and post-college).

Neighborhood level

We utilized 3 variables to capture neighborhood social environment. While there is no agreement on how to define neighborhood, census tract has been commonly used as a proxy for neighborhood. Following this conventional approach, we extracted social environment data at tract level from the 2005-2009 ACS five year estimates (Census Bureau 2010) and constructed the following three neighborhood level measures to explore whether residential social conditions matter. More specifically, the percent of owner occupied housing units and the percent of residents living at the same address for at least 5 years were first standardized. As these two variables were strongly correlated (Pearson correlation=0.70), we then used the average of these two standardized scores to represent residential stability. In addition, following Sampson et al (1997), we applied the principal component analysis (PCA) to eight socioeconomic variables drawn from ACS and the PCA results indicated that two components, neighborhood disadvantage and social affluence, would suffice to explain almost 75 percent of the total variance among these variables. Five indicators were loaded on neighborhood disadvantage: percent of housing units with more than

one person per room (factor loading=0.566), unemployment rate (0.816), percent of population receiving public assistance (0.755), poverty (0.864), and percent of female-headed households with children. By contrast, social affluence comprised the following three covariates: percent of population age 25 and over with at least a bachelor degree (0.902), percent of population employed in professional, administrative, and managerial positions (0.917), and percent of family with annual income greater than $75,000 (0.751). Using the regression method in the PCA, we calculated the factor scores for the two components and used them in future analysis (Yang and Matthews 2010).

Research Strategy

To answer our research questions, we constructed a hierarchical database by integrating individual level data with census tract level variables. We conducted five nested models by including different sets of independent variables. The first model determined whether there is a significant variance in stress between residential social conditions. The second model examined whether individual stress differs by the six parenthood/marital status groups after controlling for age, gender, education, economic difficulty and race/ethnic group. This model included a random intercept which allows the level of stress vary across residence. The third model demonstrates how the residential social conditions explained the between-social conditions variance in level of stress. The forth model embraced individual's perceptions of social support and trust from neighbors. The fifth model examined how social conditions interact with perceptions of social support and trust to affect stress.

Results

Table 1 demonstrated the descriptive statistics of the key variables of this study by the six parenthood/marital status groups. We summarized notable findings as below. First, those who are single but have minor children at home, on average, reported the highest stress level (6.31), whereas those who are widowed, separated, or divorced without minor children showed the lowest stress (4.85). Second, the average age also

varied across groups with the group of WSD without parenthood having the highest age and single with parenthood having the lowest average age. Third, in contrast to other groups, people who are married without parenthood tended to reported better perceptions of neighborhood in three measures. These variations of these variables across groups were further confirmed by our multi-level modeling results (see below).

[Table 1 Here]

Table 2 shows the multivariate analytic results. The significant random error of intercept in Model 1 indicated that the average individual stress level varied significantly across residence (i.e., census tracts), which bolsters our use of multi-level modeling. Model 2 suggested that the association between age and stress was inverse U-shaped, female and those experienced economic difficulty were more likely to report high stress. Compared with Hispanic and other races, non-Hispanic White had higher stress. Somewhat surprisingly, high education was related to high stress. More importantly, in contrast to those who are married without parenthood, people in the groups of WSD with parenthood and single with parenthood suffered from significantly higher stress, even after controlling for demographic and socioeconomic status. For other three groups, WSD without parenthood, single without parenthood, and married with parenthood, we did not find significant differences in stress compared to married individuals with minor children at home.

[Table 2 Here]

Based on Model 2, we shows how parental stress varies by age and parenthood/marital status groups in Figure 2. Interestingly, holding all covariates individuals who are married with parenthood consistently have the lowest stress but the difference between this group and those who are married without parenthood seems to be minimal. WSD and single with parenthood are experienced the highest level of stress over their life course. WSD and single without parenthood are experienced the moderate stress. Married either with or without parenthood groups are experienced better mental health, as for stress, than other groups.

While we anticipated that residential social conditions would play a role in determining individual stress, we did not find sufficient evidence for our hypothesis. Specifically, adding residential social conditions in Model 3 did not alter the associations between individual level covariates and stress as found in Model 2. Social affluence was the only significant social condition variable, which was positively associated with stress. This is an unexpected finding but it is worth noting that our SES measures are absolute measures and the relative SES measures (e.g., income inequality or racial segregation) have not been considered in the analysis. The intertwined relationships among the absolute and relative SES measures may complicate the findings of this study.

Individual's perceptions of social support and trust from neighbors were included in Model 4. As expected, individual stress level was reduced among people who reported that their neighbors intend to help others. Similarly, high levels of neighborhood belonging and trust were associated with low stress. It should also be noted that adding individual's perceptions of social support and trust seemed to account for the associations between parenthood/marital status combinations and stress. More specifically, the positive relationships between stress and "WSD with parenthood" and "single with parenthood" were decreased from Model 3 to Model 4, indicating that better individual perceptions of social support and trust from neighbors helped individuals to adapt stressors and minimize stress. It is also noteworthy to point out that the associations between stress and other types of parenthood/marital status combinations were attenuated in Model 4, in contrast to Model 3.

Model 5 was designed to explore the interaction effects of individual perception of support and trust variables and residential social conditions. The significant associations were found between "help from neighbors" and two residential variables – stability and affluence. Surprisingly, the interaction effects were positively related to stress. That being said, hold the perception of help from neighbors and other variables equal, people living in a stable and affluent area reported higher stress than

their counterparts living in an unstable and disadvantaged area. This contradicted our hypothesis; however, one plausible explanation is that some social conditions were not considered in the analysis due to the data limitations, such as crime rates. A circumstantial support for this explanation is that the variation across residence (random error of intercept) did not decrease by the inclusion of social condition variables and/or interaction effects (compared Model 2 with Model 5). Future efforts are warranted to dig this issue deeper.

Discussion

We revisited our hypotheses based on the analytic results. We first hypothesized that stress is associated with the parenthood/marital status combination and the results across multi-level regression models (Table 2) supported this statement. More specifically, in contrast to those who are married and have no minor children at home, the respondents who raised minor children alone (widowed, divorced, separate, or single) reported significantly higher daily stress. However, it should be noted that we did not find significant difference in stress among the PHMC participants who are not in parenthood (WDS or single without parenthood) and do not raise children alone (married with parenthood). Second, we found strong evidence to bolster the negative associations between subjective perceptions of neighborhood and stress. Residents who perceived stronger neighbor's willingness to help reported lower stress and this protective effect can be extended to people who trust their neighbors or reported high level of belongingness.

At neighborhood level, while we found that individual stress varies significantly across neighborhood (H3), the analytic results did not confirm our fourth hypothesis that better SES and more stable neighborhood are beneficial to lower stress. Instead, our results showed a consistent and positive relationship between neighborhood affluence. Finally, we did not find support for the last hypothesis that neighborhood SES or stability interacts with individual's perceptions of neighborhood to alleviate stress. Surprisingly, given the same level of perceived neighbor's willingness to help,

people reported higher stress when living in a more affluent or stable neighborhood than those living in a community with more disadvantaged groups or turnovers.

To reiterate, our findings suggested that individual stress is a function of parenthood and marital statuses and the presence of partner seems to play a crucial role in determining stress. Those who are single and have a minor child at home suffered from stress most, and those who *had* a partner before (WDS) and are in parenthood showed the second highest stress, *ceteris paribus*. This relationship not only echoes the literature that unmarried women with children were at a greater risk of poor health than those who are married with children or unmarried men with children (Mulsow et al. 2002, Copeland and Harbaugh 2005), but also provides nuanced insight into different combinations between parenthood and marital statuses.

Another important contribution of this study is to confirm the associations between subjective perceptions of neighborhood and stress, which has been underexplored in the literature. Neighbor's willingness to help, neighborhood trust, and belongingness were found to be negatively related to stress and including them in the models further reduced the impacts of parenthood/marital status by roughly 7 percent for the group of WDS with parenthood (see Models 3 and 4 in Table 2, (0.092-0.086)/0.092=0.065) and about 18 percent for the group of single with parenthood ((0.118-0.097)/0.118=0.178). That being said, the interactions among residents within a neighborhood could be regarded as a moderator of stress.

We further illustrate the protective effects of subjective perceptions of neighborhood in Figure 3. Specifically, assume other covariates are the same, we first estimated the stress levels (in log) for white females who were categorized into the following three levels: married without parenthood (black solid line with diamonds), single with parenthood (red dashed line with triangles), and WDS with parenthood (red dotted line with triangles). For the latter two groups, we then took the impacts of neighbor's willingness to help and belongingness into account and the results were shown as blue dashed line with asterisks (single with parenthood) and blue dotted line

with asterisks (WDS with parenthood). Compared with the original stress levels (lines with triangles), the inclusion of these two neighborhood perception variables attenuated the stress significantly and made the stress levels fairly close to the group of married without parenthood. After including trust for neighbors in our analysis, the stress levels were further decreased (dashed line with circles and dotted line with circles) and were even lower than those who are married and have no minor children at home. The pattern depicted above was consistent regardless of respondent's age.

Following the theoretical pathways (Ross and Jane 2000; Ross and Mirowsky 2001, 2009), the social network/capital resulted from social interactions could become a major source of help with childbearing, which is insufficient in families without the presence of partners (WDS or single with parenthood). Our finding underscores the importance of the interactions among residents and the subject perceptions of neighborhood and neighbors. It is clear that environment where a family lives contributes to stress, especially among those in parenthood without partners.

Though many previous studies suggested that neighborhood SES or stability are moderating factors for stress and facilitators for health (Boardman 2004; Stockdale et al. 2007; Schieman 2009), we found a positive relationship between social affluence and stress, and no statistical association between stability and stress. Despite the unexpected relationship between social affluence and stress, our analysis did indicate that high level of stress could be attributed to the social conditions that are beyond individual's characteristics, highlighting a possible mechanism from neighborhood to individual health. One plausible explanation for the unexpected positive association is that other social conditions that may be confounded with SES were not considered in the analysis due to the data limitations, such as inequality, separation and neighborhood safety. While these factors have been found to be important in determining human health (Williams and Collins 2001; Marmot 2004), their impacts on parental stress remain unclear.

In this study, we also examine whether the interactions between subjective

perceptions of neighborhood and social environmental factors impose effects on individual stress. While the results support our basic anticipation that environmental factors beyond individual matters but their impacts on stress are in unexpected directions. More explicitly, we found that the beneficial effect of perceived neighbor's willingness to help on stress depends on residential conditions, such as residential stability and social affluence factor. However, we found that this beneficial effect will be compromised by high residential stability and social affluence. Again, the lack of other social environment measures may contribute to this surprising result.

Limitation and Policy Implications

Several limitations emerge from our multilevel analysis in 8,743 residents within 952 neighborhoods. The first lies in the nature of cross-section data. Although the PHMC data set provides consistent measures of socio-demographic and neighborhood characteristics, and sufficient sample that facilitate the investigation of parenthood/ marital status group differences in stress, its cross-sectional data structure prevents researchers from examining individuals' experiences in critical events such as moving into dangerous neighborhood or marital transition, and how they relate to changes in level of stress. It takes a longitudinal study to fully untangle the causal relationships between parental stress and other key variables. Second, though neighborhood characteristics do directly associate with the level of stress, the model did not include all dimensions of neighborhood, such as crime rate; and did not include any activities of residents' proceed relating to social affluence neighborhood. Finally, the change in the definition of neighborhood may alter the conclusions of this study, a well-known issue called the modifiable areal unit problem (Openshaw 1984).

Some policy implications could be drawn from this study. First, as the presence of partners in families with minor children is a crucial determinant of stress, social services or subsidies, such as parenting skill training and childcare support, should be offered to those who raise children alone. Second, the protective effects of subjective perceptions of neighborhood on stress underscore the importance of developing an

environment that facilitates interactions among residents. Frequent interactions would enhance mutual trust among neighbors, promote individual's willingness to help, and reinforce the sense of belongingness. All of these would alleviate personal daily stress. Finally, extending the subjective perceptions of neighborhood to the aggregate level, it becomes clear that living in a more cohesive area would bring more resources that help individuals to cope with daily stressors and hence improve mental health.

Table 1: Descriptive statistics for individual level variables by parenthood/marital status groups

Variables	N	Min	Max	Mean	S.D		N	%
Total Sample								
Stress	8376	1	10	5.272	2.644	Gender: Male	2793	33.35
Age	8376	18	99	51.821	15.628	Gender: Female	5583	66.65
Education	8376	1	4	2.717	0.824	Race: Non-Hispanic White	5771	68.90
Economic Difficulty	8376	1	4	2.339	1.024	Race: Non-Hispanic Black	1911	22.82
Neighborhood Perception: Help	8376	1	5	3.641	1.180	Race: Hispanic/others	694	8.29
Neighborhood Perception: Belonging	8376	1	4	3.201	0.700			
Neighborhood Perception: Trust	8376	1	4	3.049	0.772			
Married without parenthood								
Stress	2993	1	10	4.976	2.575	Gender: Male	1177	39.33
Age	2993	18	92	55.940	13.889	Gender: Female	1816	60.67
Education	2993	1	4	2.790	0.822	Race: Non-Hispanic White	2375	79.35
Economic Difficulty	2993	1	4	2.145	0.988	Race: Non-Hispanic Black	433	14.47
Neighborhood Perception: Help	2993	1	5	3.781	1.127	Race: Hispanic/others	185	6.18
Neighborhood Perception: Belonging	2993	1	4	3.267	0.656			
Neighborhood Perception: Trust	2993	1	4	3.175	0.717			
WDS without parenthood								
Stress	1435	1	10	4.850	2.860	Gender: Male	339	23.62
Age	1435	21	97	65.578	12.664	Gender: Female	1096	76.38
Education	1435	1	4	2.456	0.838	Race: Non-Hispanic White	990	68.99
Economic Difficulty	1435	1	4	2.346	1.044	Race: Non-Hispanic Black	347	24.18
Neighborhood Perception: Help	1435	1	5	3.619	1.254	Race: Hispanic/others	98	6.83
Neighborhood Perception: Belonging	1435	1	4	3.231	0.681			
Neighborhood Perception: Trust	1435	1	4	3.072	0.742			
Single without parenthood								
Stress	1292	1	10	5.422	2.676	Gender: Male	486	37.62
Age	1292	18	99	47.114	15.738	Gender: Female	806	62.38
Education	1292	1	4	2.688	0.795	Race: Non-Hispanic White	725	56.11
Economic Difficulty	1292	1	4	2.383	1.043	Race: Non-Hispanic Black	431	33.36
Neighborhood Perception: Help	1292	1	5	3.490	1.202	Race: Hispanic/others	136	10.53
Neighborhood Perception: Belonging	1292	1	4	3.074	0.720			
Neighborhood Perception: Trust	1292	1	4	2.836	0.789			
Married with parenthood								
Stress	1856	1	10	5.559	2.331	Gender: Male	659	35.51
Age	1856	18	82	42.074	9.327	Gender: Female	1197	64.49
Education	1856	1	4	2.934	0.768	Race: Non-Hispanic White	1388	74.78
Economic Difficulty	1856	1	4	2.404	0.974	Race: Non-Hispanic Black	294	15.84
Neighborhood Perception: Help	1856	1	5	3.710	1.096	Race: Hispanic/others	174	9.38
Neighborhood Perception: Belonging	1856	1	4	3.258	0.691			
Neighborhood Perception: Trust	1856	1	4	3.131	0.751			
WDS with parenthood								
Stress	347	1	10	6.110	2.791	Gender: Male	69	19.88
Age	347	21	92	49.061	12.945	Gender: Female	278	80.12
Education	347	1	4	2.559	0.822	Race: Non-Hispanic White	187	53.89
Economic Difficulty	347	1	4	2.856	0.969	Race: Non-Hispanic Black	123	35.45
Neighborhood Perception: Help	347	1	5	3.444	1.247	Race: Hispanic/others	37	10.66
Neighborhood Perception: Belonging	347	1	4	3.095	0.733			
Neighborhood Perception: Trust	347	1	4	2.974	0.788			
Single with parenthood								
Stress	453	1	10	6.313	2.790	Gender: Male	63	13.91
Age	453	18	84	36.501	11.792	Gender: Female	390	86.09
Education	453	1	4	2.373	0.744	Race: Non-Hispanic White	106	23.40
Economic Difficulty	453	1	4	2.810	1.045	Race: Non-Hispanic Black	283	62.47
Neighborhood Perception: Help	453	1	5	3.091	1.265	Race: Hispanic/others	64	14.13
Neighborhood Perception: Belonging	453	1	4	2.887	0.840			
Neighborhood Perception: Trust	453	1	4	2.481	0.858			

Table 2: Multi-level modeling results for individual stress in the Philadelphia metropolitan area

	Model 1	S.E		Model 2	S.E		Model 3	S.E		Model 4	S.E		Model 5	S.E	
Intercept (β0j)	1.487	(.007)	***	1.277	(.029)	***	1.280	(.027)		1.276	(.028)	***	1.277	(.029)	***
Individual Level															
WDS without parenthood				0.035	(.022)		0.039	(.021)	†	0.031	(.023)		0.029	(.023)	
Single without parenthood				0.029	(.021)		0.032	(.021)		0.022	(.021)		0.023	(.021)	
Married with parenthood				-0.019	(.018)		-0.021	(.019)		-0.014	(.018)		-0.014	(.018)	
WDS with parenthood				0.091	(.034)	***	0.092	(.035)	***	0.086	(.033)	**	0.085	(.033)	**
Single with parenthood				0.115	(.033)	***	0.118	(.034)	***	0.097	(.033)	***	0.100	(.033)	**
Age				0.011	(.003)	***	0.011	(.002)	***	0.012	(.003)	***	0.012	(.003)	***
Age-squared				-.00021	(.000)	***	-.00021	(.000)	***	-.00021	(.000)	***	-.00021	(.000)	***
Female				0.130	(.015)	***	0.130	(.014)	***	0.132	(.015)	***	0.132	(.015)	***
Non-Latino White (Ref: Lationo/Others)				0.165	(.026)	***	0.157	(.026)	***	0.165	(.027)	***	0.166	(.027)	***
Non-Latino Black				0.024	(.030)		-0.019	(.027)		-0.020	(.030)		-0.022	(.030)	
Education				0.062	(.009)	***	0.056	(.009)	***	0.060	(.010)	***	0.060	(.009)	***
Economic Difficulty				0.138	(.007)	***	0.139	(.007)	***	0.132	(.007)	***	0.132	(.007)	***
Neighborhood Perception: Intend to help										-0.028	(.007)	***	-0.028	(.007)	***
Neighborhood Perception: Belonging										-0.049	(.011)	***	-0.049	(.011)	***
Neighborhood Perception: Trust										-0.030	(.012)	***	-0.030	(.012)	***
Social Environment Level															
Residential Stability							0.002	(.012)		-0.006	(.012)		-0.0008	(.013)	
Social Affluence Factor							0.023	(.011)	*	0.024	(.010)	*	0.025	(.010)	*
Neighborhood Disadvantage Factor							-0.006	(.010)		0.000	(.009)		0.001	(.009)	
Cross-Level Interaction															
Intend to help × Residential Stability													0.023	(.011)	*
Intend to help × Social Affluence Factor													0.027	(.012)	*
Intend to help × Neighborhood Disadvantage Factor													0.002	(.011)	
Belonging × Residential Stability													-0.009	(.016)	
Belonging × Social Affluence Factor													-0.013	(.017)	
Belonging × Neighborhood Disadvantage Factor													-0.013	(.015)	
Trust × Residential Stability													0.008	(.017)	
Trust × Social Affluence Factor													0.002	(.016)	
Trust × Neighborhood Disadvantage Factor													0.010	(.015)	
Random Effect	**Variance**	**SD**		**Variance**	**SD**		**Variance**	**SD**		**Variance**	**SD**		**Variance**	**SD**	
Intercept	0.005	(.076)	**	0.003	(.061)	*	0.003	(.060)	*	0.003	(.062)	*	0.003	(.061)	*
Individual Level Error	0.424	(.650)		0.359	(.600)		0.359	(.599)		0.355	(.595)		0.354	(.595)	
Deviance	16349			15042			15060			14980			15036		

*** p<.001 ** p<.01 * p<.05 †p < .10

Note1: coefficients reported by estimation with robust standard errors.

Note2: Age, age-square, education, economic difficulty, neighborhood perception and social environmental variables are grand-mean centering.

Figure2: Estimated Level of Log(stress) by Six Parenthood / Marital Status Groups

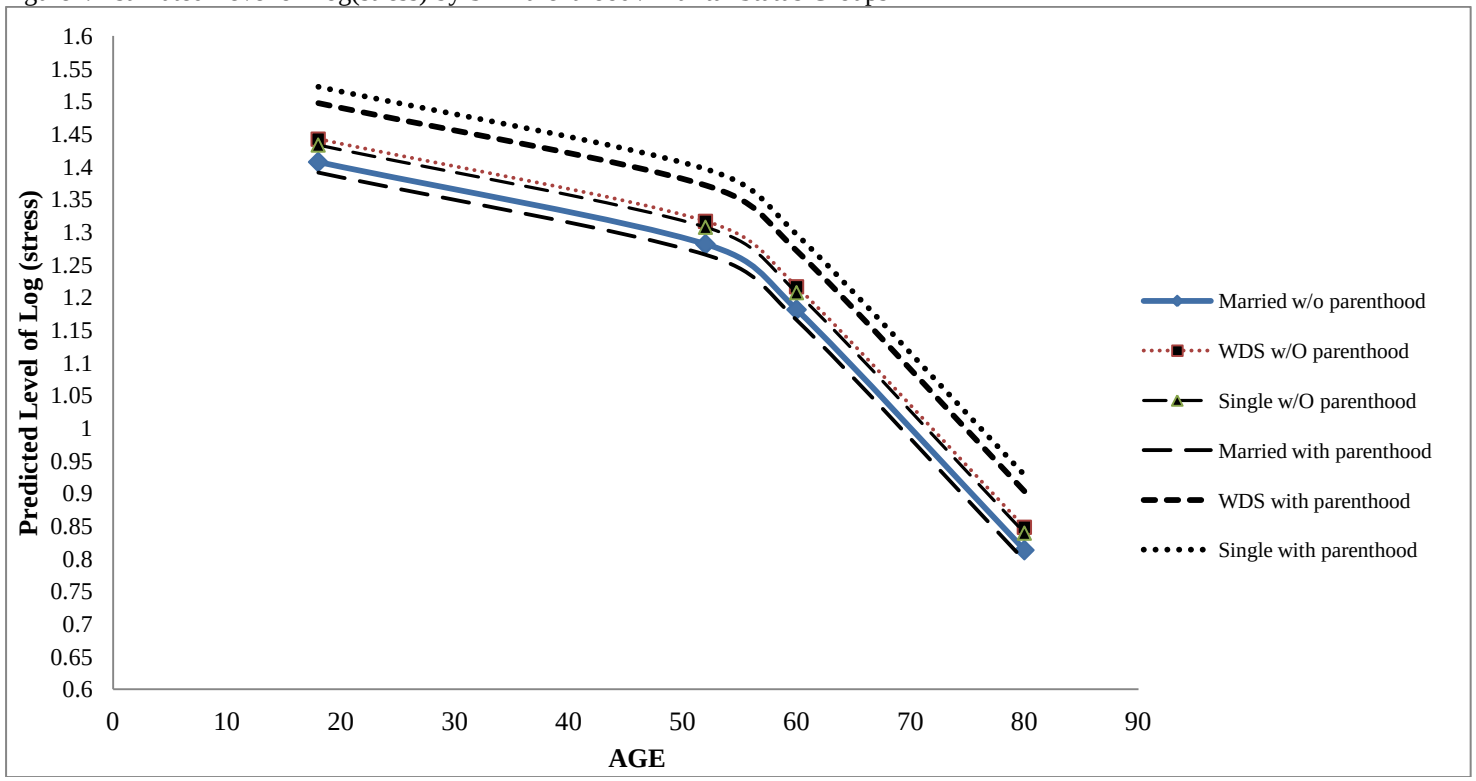
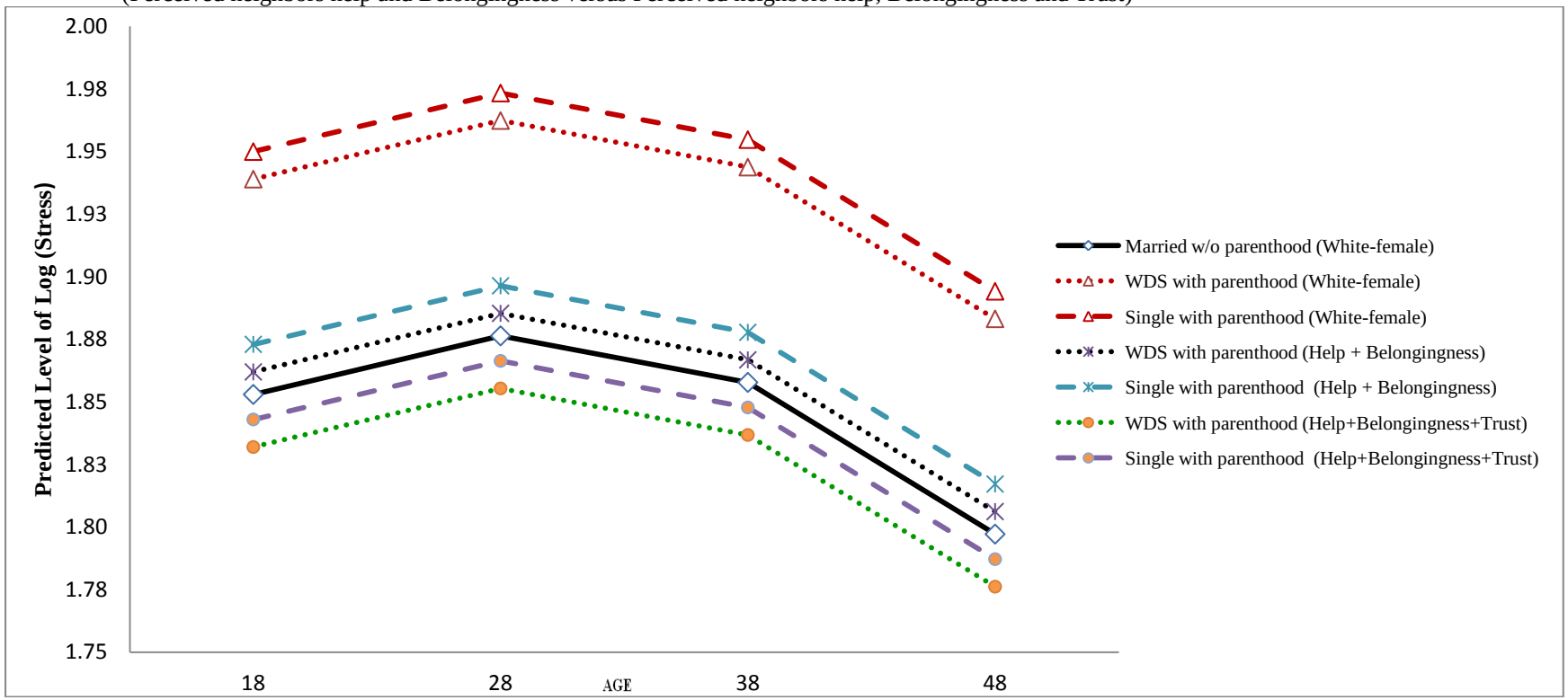


Figure 3: Estimated White-Female with Economic Hardship Level of Log (stress) for Married w/o parenthood versus WDS with parenthood and Single with parenthood (Perceived neighbors help and Belongingness versus Perceived neighbors help, Belongingness and Trust)



Note: The reference groups are white women with economic hardship in the group of Married without parenthood, WDS with parenthood and Single with parenthood.

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