THE CAUSAL EFFECTS OF MATERNAL EMPLOYMENT ATTRIBUTES ON FAMILY HEALTH OUTCOMES AND HEALTH DISPARITIES: IMPLICATIONS FOR POLICY AND PRACTICE

Megan Elizabeth Shepherd-Banigan

A dissertation submitted in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

University of Washington

2014

Reading Committee:

Janice F. Bell, Chair

Anirban Basu

Cathryn Booth-LaForce

Jeffrey R. Harris

Program Authorized to Offer Degree:

Public Health-Health Services

University of Washington

University of Washington

ABSTRACT

Examining the Contribution of Maternal Employment to Disparities in Maternal and Child Health

Megan Shepherd-Banigan

Chair of the Supervisory Committee

Janice F. Bell, Assistant Professor

Department of Health Services

Socioeconomic disparities in maternal and child health are well-known, widespread problems in the US. A high proportion of women with young children participate in the labor force making maternal employment attributes, such as income, leave benefits, workplace flexibility, and stress potential determinants of maternal and child health inequalities. This dissertation research examined the contribution of maternal employment attributes to family health outcomes and disparities, including adolescent health, maternal depressive symptoms, and pediatric preventive service utilization.

To examine the effect of maternal paid leave (sick and vacation) and work intensity on pediatric preventive care among children aged 0-17, we used data from the Medical Expenditures Panel Survey and the National Health Interview Survey (years 2007-2010) and applied instrumental variable techniques. Our results demonstrate that paid sick leave may influence compliance with several preventive care services for children, including well-child visits, dental care and receipt of the influenza vaccine. Paid sick leave predicted an increase in the marginal probability of complying with recommended well-child visits (0.13; 95% CI: 0.032, 0.23), dental exams (0.31; 95% CI: 0.15, 0.47), preventive dental care (0.30; 95% CI: 0.11, 0.50), and influenza vaccines (0.17; 95% CI: 0.07, 0.27).

To study the relationship between maternal employment attributes and maternal depressive symptoms among women with very young children, we examined data from the NICHD (National Institute of Child Health and Development) Early Child Care and Youth Development Study (SECCYD) (years 1991-2005). Results from individual fixed effects analyses suggest that some employment attributes may predict depressive symptoms. Women who worked from home reported a statistically significant decrease in depression scores over time (β=-1.60, SE=0.53, p=0.002). Women who reported a one-unit increase in job concerns experienced, on average, a 2-point increase in depression scores over time (β=1.91, SE=0.43, $p<0.01$).

Finally, we used data from the NICHD SECCYD and endogenous treatment effect models to assess the influence of cumulative maternal income (between birth and 3rd grade) on adolescent health and development. We found no evidence that cumulative maternal income predicted adolescent outcomes. However, other components of the early family environment were related to specific outcomes. A one-unit increase in family socioeconomic status was associated with a 0.05 point decrease in the probability of being overweight or obese at age 15. High work intensity (more periods of employment over time and more hours worked per week) and high birth weight (>4,000 grams) were also associated with a 0.09 and 0.10 point increase in the probability of being overweight or obese at age 15, respectively. Higher levels of health endowment were predictive of improved adolescent outcomes at age 15, including better health status, fewer behavioral problems, and no tobacco use. Parental marital status (being married) and White race/ethnicity were also protective against risk-taking.

Results from this dissertation research suggest that maternal employment attributes exert real and important influences on family health. Our research highlights the effects of specific attributes, including paid sick leave, schedule control and flexibility, supportive work environments, and work intensity on various maternal and child health outcomes. These findings suggest that policies to assure adequate access to leave and flexible working hours and locations might ease the challenges faced by working families.

ACKNOWLEDGEMENTS

First I'd like to thank my family, especially Dan, my parents, and grandparents, for their support and encouragement in my pursuit of this degree both in the years leading up to and during it.

I would also like to acknowledge and thank my dissertation committee, Janice, Jeff, Anirban and Cathryn, for their tremendous encouragement and support, substantial time investments, and thoughtful feedback at each point. I would also like to thank additional mentors who supported me and gave me opportunities to round out my educational experience: Dave Grembowski, Beti Thompson, Sara Mackenzie, Doug Conrad, and Colleen Huebner.

Thank you to the National Institute of Occupational Safety and Health (NIOSH) and the National Center for Advancing Translational Sciences (NCATS) and the affiliated faculty (Diane Martin, Jeff Harris, Jeanne Sears, Linda LeResche and Joie Whitney) for supporting my doctoral training.

And last but not least, a big thank you to the Health Services PhD Program women whose willingness to listen and problem-solve any issue from methodological research challenges, STATA commands, to child rearing has been a tremendous pillar of support for me throughout.

DEDICATION

For Grandma & Grandpa Neidig

TABLE OF CONTENTS

LIST OF FIGURES, TABLES, AND APPENDICES

Chapter 1

INTRODUCTION

Background and Conceptual Model

Socioeconomic disparities in maternal and child health outcomes, including adolescent health, maternal depression, and use of pediatric health services, are well-known, widespread problems in the US.[1] The determinants of health disparities, such as race/ethnicity, income inequalities, social class, education, and neighborhood factors have been extensively studied. However, maternal employment attributes, such as income, leave benefits, and workplace flexibility and stress are determinants of health inequalities that require more scholarly attention.

The rate of labor force participation among married women with children under 18 has steadily increased over the past 2 decades reaching 71.2% in 2008.[2] This has motivated a considerable amount of academic research about the association between maternal employment and family health outcomes in the past few decades, but the evidence about the significance of the effects, directionality and the potential mechanisms is still conflicting.[3] Studies have demonstrated positive outcomes associated with maternal employment,[4] including improved access to health care due to employer sponsored insurance[5] and income to purchase goods, such as healthy foods.[6] Children whose mothers work also receive higher scores on cognitive achievement tests.[4] However, maternal employment has also been associated with negative outcomes for children, including overweight and obesity,[7] behavioral problems and risk-taking,[8] and a higher incidence of ear and respiratory infections.[4]

The relationships between maternal work and family well-being are complex as health outcomes are influenced by specific job attributes.[9] Work schedule, flexibility, paid leave, work intensity, the psycho-social environment, and income all influence the well-being of working mothers and their children, but through distinct pathways.[10,11] Figure 1.1 presents a conceptual model that illustrates how employment attributes affect access to care and health outcomes of families with children under age 18. Flexibility,

paid leave, work intensity (average number of hours worked per week), and work schedule (time of day/amount of time spent at work) can increase time flexibility for employed mothers to address family health needs, such as medical appointments, and may also offset the monetary costs of foregone wages.[10,12,13] These workplace attributes may also directly reduce mental distress for parents with young children by decreasing stress.[10,14–17] Poor psychosocial work environments, defined by lack of supervisor and organizational support and low levels of job control, restrict the ability of parents to adequately meet the needs of their families resulting in increased work/family conflict and higher levels of mental distress among working parents.[10,16,18–22] Maternal income provides monetary flexibility that can be used to invest in family health and may also offset time costs associated with family demands. Further, income level and stability are associated with maternal psychological distress.[23] In addition, socio-demographic factors, including the age and gender of children in the household, race/ethnicity, social support,[24–27] and family socioeconomic status,[3,28,29] may modify these associations further adding to the complexity of syphoning out cause and effect. For instance, longer maternal working hours may have more harmful consequences for children from advantaged backgrounds when compared with their relatively disadvantaged peers because they may be spending less time in a more enriching home environment.[29] However, low income children may also be at higher risk for emotional and behavioral difficulties if their parents are exposed to stressful working environments.[11] Additional details about the Conceptual Model are presented in Appendix A.

While many studies have focused on the influence of maternal employment on family health, few have examined the effect of specific attributes of maternal employment, such as maternal share of household income, workplace flexibility, paid leave, work schedule, and workplace stress on maternal and child health outcomes and the demand for health services. Given the dramatic increase in the prevalence of working mothers and the minimal legal protections afforded to working parents in the United States,[30,31] there is a need to strengthen this evidence base. Further, more research is needed to examine how socio-

demographic factors moderate the associations between workplace attributes and maternal and child outcomes to explain these disparities.

This dissertation research is especially relevant given the National Institute of Occupational Safety and Health's (NIOSH) recent shift from a sole focus on worksite risks to a holistic approach that recognizes the influence of risks beyond the work environment on worker productivity and health. Through the Total Worker Health Program, NIOSH promotes worksite strategies that can address social and behavioral factors that influence health outcomes for workers and their families.[32] Finally, there are currently a number of political movements across the US at the federal, state, and city levels advocating for improved workplace policies that enhance support for workers and their families.[33,34] Thus, this research is timely and has the potential to provide compelling evidence to support political mandates that advocate for more generous workplace policies to improve the lives of working parents and their children.

Specific Aims

The objective of this dissertation is to examine the contribution of maternal employment attributes to family health outcomes and disparities, including adolescent health, maternal depression, and pediatric preventive service utilization. These outcomes were chosen because previous research shows that they are influenced by maternal employment, but there is still debate about the mechanisms at play. In addition, these outcomes have important ramifications for the overall health and well-being of women and children.

Aim 1: The relationship between workplace attributes and the use of preventive pediatric services

Specific Aim 1a assessed whether maternal workplace attributes, such as the number of hours worked and paid sick and vacation leave, are associated with the utilization of preventive child health services such as the receipt of American Academy of Pediatrics (AAP) and the American Academy of Pediatric Dentistry (AAPD) recommended age-appropriate preventive health and dental care for children aged 0-17. We hypothesized that children whose mothers were exposed to workplace attributes that increased time and

monetary flexibility would be more likely to achieve compliance with AAP and AAPD recommended preventive care services in the past 12 months.

Specific Aim 1b examined whether family income level, maternal education, and marital status modify the association between maternal workplace attributes and the use of preventive child health services. We hypothesized that among children whose mothers were exposed to similar levels of workplace benefits, children from low-income families, those whose mothers were unmarried, and those whose mothers had lower levels of education, would be less likely to achieve compliance with AAP and AAPD recommended preventive care services in the past 12 months when compared with children from higher-income families, and whose mothers were married and had higher levels of education.

Aim 2: The relationship between workplace attributes and maternal depressive symptoms

Specific Aim 2a examined whether maternal workplace attributes such as number of hours worked, flexibility, work schedule, working from home, and workplace stress are associated with depressive symptoms in women with children from 6 to 24 months of age. We hypothesized that women who were exposed to workplace attributes that promote work/life balance would have lower depression scores.

Specific Aim 2b studied whether social support, marital status, and family income moderate the relationship between workplace attributes and depressive symptoms in women who return to work within 24 months after the birth of their child. We hypothesized that the relationship between workplace attributes and depression score would be stronger among women who reported lower levels of social support and family income and were unmarried.

Aim 3: The influence of maternal income on adolescent health and behavioral outcomes

Specific Aim 3a assessed whether individual differences in child weight and health status and behavioral outcomes are predicted by cumulative maternal income above and beyond the influence of family income and employment duration. We hypothesized that cumulative maternal income would be positively related

to better health and behavioral outcomes (lower overweight/obesity, higher health status, fewer negative behavioral outcomes) when controlling for family income and long term employment duration.

Causal inference

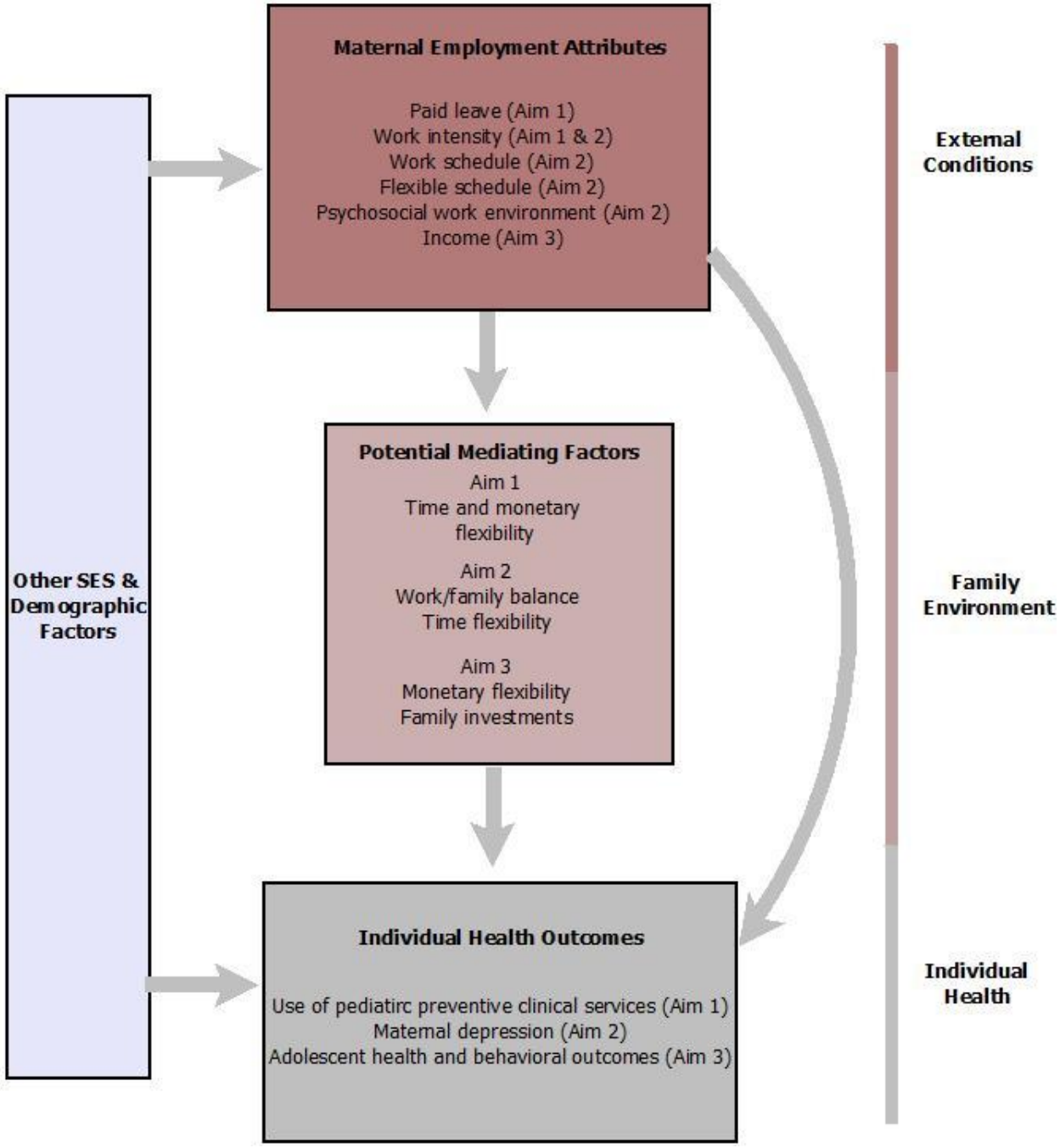
This dissertation research attempts to extend current knowledge by examining an understudied component of maternal and child health and by applying causal inference methods to understand the effects of workplace attributes on maternal and child health outcomes. Each of the questions posed are limited by threats to causal inference, including unobserved confounding, selection bias, reverse causality, and dynamic relationships over time. For example, child weight status at age 5 may influence child weight status, health and possibly maternal income at age 10. Causal inference techniques attempt to address the unobserved heterogeneity, or the correlation of errors between the treatment and outcome, that occurs in most observational studies due to the inability to measure all confounding factors.[35,36] Hence, causal inference methods attempt to test the counterfactual--the hypothetical concept of what would have happened to the same person had they received the treatment and not received the treatment, thereby deriving estimates of cause and effect.[37,38] For each study the threats to causal inference are considered and specific design features and methods are used to minimize potential bias resulting from unobserved heterogeneity. Additional details about the specific nature of the threats to causal inference, measures taken to address these threats, and methodological assumptions are provided in each subsequent chapter.

Conclusion

This dissertation research addresses key gaps in the evidence base about the effect of workplace attributes, including maternal income, number of hours worked, flexibility, leave benefits, work schedule, and stress on maternal and child health outcomes and health disparities. Chapter 2 examines how maternal paid leave (sick and vacation) and work intensity affect compliance with recommended pediatric preventive services for children aged 0-18 years. Chapter 3 assesses the impact of workplace flexibility (including working from home), work schedule, job stress, and work intensity on depressive symptoms

among employed women with young children. Chapter 4 investigates the influence of cumulative maternal income on adolescent weight and health status, risky behaviors, problem behaviors, and psychosocial maturity at age 15. Given the renewed political interest in the effect of workplace policies on family health outcomes, this is an exciting time to study these issues and to contribute to existing efforts to advocate for workplace policy interventions that have positive effects on family health.

Figure 1. Conceptual Model of Maternal Employment Attributes and Family Health Outcomes



References

1. Simpson L, Owens PL, Zodet MW, et al. Health care for children and youth in the United States: annual report on patterns of coverage, utilization, quality, and expenditures by income. *Ambul Pediatr*. 5(1):6–44. doi:10.1367/A04-119R.1.

2. Bureau of Labor Statistics. *Employment characteristics of families in 2007*. Washington, DC; 2009. Available at: http://www.bls.gov/news.release/archives/famee_05272009.pdf.

3. Bianchi S, Milkie M. Work and Family Research in the First Decade of the 21st Century. *J Marriage Fam*. 2010;72:705–725.

4. Moore KA, Driscoll AK. Low-wage maternal employment and outcomes for children: a study. *Future Child*. 1997;7(1):122–7. Available at: http://www.ncbi.nlm.nih.gov/pubmed/9170739. Accessed June 8, 2012.

5. Rolett A, Parker JD, Heck KE, Makuc DM. Parental employment, family structure, and child's health insurance. *Ambul Pediatr*. 1(6):306–13. Available at: http://www.ncbi.nlm.nih.gov/pubmed/11888420. Accessed June 8, 2012.

6. Kenney C. Father doesn't know best? Parents' control of money and children's food insecurity. *J Marriage Fam*. 2008;70(August):654–669. Available at: http://onlinelibrary.wiley.com/doi/10.1111/j.1741-3737.2008.00512.x/full. Accessed July 19, 2012.

7. Anderson PM, Butcher KF, Levine PB. Maternal employment and overweight children. *J Health Econ*. 2003;22(3):477–504. doi:10.1016/S0167-6296(03)00022-5.

8. Aizer A. Home Alone: Maternal Employment, Child Care and Adolescent Behavior. 2001. Available at: http://www.econ.ucla.edu/workingpapers/wp807.pdf.

9. Parcel TL, Menaghan EG. Effects of low-wage employment on family well-being. *Future Child*. 1997;7(1):116–21. Available at: http://www.ncbi.nlm.nih.gov/pubmed/9170738. Accessed June 8, 2012.

10. Cooklin AR, Canterford L, Strazdins L, Nicholson JM. Employment conditions and maternal postpartum mental health: results from the Longitudinal Study of Australian Children. *Arch Womens Ment Health*. 2011;14(3):217–25. doi:10.1007/s00737-010-0196-9.

11. Strazdins L, Shipley M, Clements M, Obrien L V, Broom DH. Job quality and inequality: parents' jobs and children's emotional and behavioural difficulties. *Soc Sci Med*. 2010;70(12):2052–60. doi:10.1016/j.socscimed.2010.02.041.

12. Vistnes JP, Hamilton V. The time and monetary costs of outpatient care for children. *Am Econ Rev*. 1995;85(2):117–21. Available at: http://www.ncbi.nlm.nih.gov/pubmed/10160522. Accessed July 17, 2012.

13. Colle A, Grossman M. Determinants of pediatric care utilization. *J Hum Resour*. 1978;XIII(Supp 1978):115–158.

14. Killien MG, Habermann B, Jarrett M. Influence of employment characteristics on postpartum mothers' health. *Women Health*. 2001;33(1-2):63–81. Available at: http://www.ncbi.nlm.nih.gov/pubmed/11523641. Accessed July 25, 2012.

15. Strazdins L, Shipley M, Broom D. What does family-friendly really mean? Wellbeing, time and quality of parents' jobs. *Aust Bull Labor*. 2007. Available at: http://www.thefreelibrary.com/What does family-friendly really mean? Wellbeing, time, and the...-a0173643846.

16. Dagher RK, McGovern PM, Alexander BH, Dowd BE, Ukestad LK, McCaffrey DJ. The psychosocial work environment and maternal postpartum depression. *Int J Behav Med*. 2009;16(4):339–46. Available at: http://www.ncbi.nlm.nih.gov/pubmed/19288209. Accessed July 25, 2012.

17. Pearlin LI, Lieberman MA, Menaghan EG, Mullan JT. The stress process. *J Health Soc Behav*. 1981;22(4):337–56. Available at: http://www.ncbi.nlm.nih.gov/pubmed/7320473. Accessed July 25, 2012.

18. Nieuwenhuijsen K, Bruinvels D, Frings-Dresen M. Psychosocial work environment and stress-related disorders, a systematic review. *Occup Med (Lond)*. 2010;60(4):277–86. doi:10.1093/occmed/kqq081.

19. Cooklin AR, Rowe HJ, Fisher JRW. Employee entitlements during pregnancy and maternal psychological well-being. *Aust N Z J Obstet Gynaecol*. 2007;47(6):483–90. doi:10.1111/j.1479-828X.2007.00784.x.

20. Allen TD. Family-Supportive Work Environments: The Role of Organizational Perceptions. *J Vocat Behav*. 2001;58(3):414–435. doi:10.1006/jvbe.2000.1774.

21. Grice MM, Feda D, McGovern P, Alexander BH, McCaffrey D, Ukestad L. Giving birth and returning to work: the impact of work-family conflict on women's health after childbirth. *Ann Epidemiol*. 2007;17(10):791–8. Available at: http://www.ncbi.nlm.nih.gov/pubmed/17719242. Accessed July 25, 2012.

22. Grice MM, McGovern PM, Alexander BH, Ukestad L, Hellerstedt W. Balancing work and family after childbirth: a longitudinal analysis. *Womens Health Issues*. 2011;21(1):19–27. Available at: http://www.ncbi.nlm.nih.gov/pubmed/21185988. Accessed July 25, 2012.

23. Yeung WJ, Linver MR, Brooks-Gunn J. How Money Matters for Young Children's Development: Parental Investment and Family Processes. *Child Dev*. 2002;73(6):1861–1879. doi:10.1111/1467-8624.t01-1-00511.

24. Jansen NWH, Kant I, Kristensen TS, Nijhuis FJN. Antecedents and consequences of work-family conflict: a prospective cohort study. *J Occup Environ Med*. 2003;45(5):479–91. Available at: http://www.ncbi.nlm.nih.gov/pubmed/12769054. Accessed June 8, 2012.

25. Dagher RK, McGovern PM, Dowd BE, Lundberg U. Postpartum depressive symptoms and the combined load of paid and unpaid work: a longitudinal analysis. *Int Arch Occup Environ Health*. 2011;84(7):735–43. Available at: http://www.ncbi.nlm.nih.gov/pubmed/21373878. Accessed July 25, 2012.

26. Killien MG. The role of social support in facilitating postpartum women's return to employment. *J Obstet Gynecol Neonatal Nurs*. 2005;34(5):639–46. doi:10.1177/0884217505280192.

27. McGovern P, Dowd B, Gjerdingen D, et al. Postpartum health of employed mothers 5 weeks after childbirth. *Ann Fam Med*. 2006;4(2):159–67. Available at: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1467019&tool=pmcentrez&rendertype=abstract. Accessed July 25, 2012.

28. Baker E, Balistreri KS, Van Hook J. Maternal employment and overweight among Hispanic children of immigrants and children of natives. *J Immigr Minor Health*. 2009;11(3):158–67. doi:10.1007/s10903-007-9096-0.

29. Ruhm CJ. Maternal Employment and Adolescent Development. *Labour Econ*. 2008;15(5):958–983. doi:10.1016/j.labeco.2007.07.008.

30. Ruhm CJ. Policies to assist parents with young children. *Future Child*. 2011;21(2):37–68. Available at: http://www.ncbi.nlm.nih.gov/pubmed/22013628. Accessed June 21, 2012.

31. Berger LM, Hill J, Waldfogel J. Maternity leave, early maternal employment and child health and development in the US*. *Econ J*. 2005;115(501):F29–F47. doi:10.1111/j.0013-0133.2005.00971.x.

32. CDC-NIOSH Total Worker Health Program. 2014. Available at: http://www.cdc.gov/niosh/twh/.

33. Lewis J, Moore G, McGovern J, Tierney J. *H.R> 1851: Family Act of 2013*. Washington, DC: United States House of Representatives; 2013.

34. Ludden J. If you want flextime but are afraid to ask, consider moving. 2014. Available at: http://www.npr.org/2014/04/29/307956811/if-you-want-flextime-but-are-afraid-to-ask-head-to-vermont.

35. Pearl J. Causal inference in statistics: An overview. *Stat Surv*. 2009;3:96–146. doi:10.1214/09-SS057.

36. Shaddish W, Cook T, Campbell D. *Experimental and Quasi Experimental Designs for Generalized Causal Inference*. Belmond, CA: Wadsworth; 2002.

37. Rubin DB. Estimating causal effects of treatments in randomized and nonrandomzied studies. *Psychology*. 1974;66:688–701.

38. Schneider B, Carnoy M, Kilpatrick J, Schmidt W, Shavelson R. *Estimating causal effects using experimental and observational designs*. Washington, DC; 2007. Available at: http://weraonline.org/uploadedFiles/Publications/Books/Estimating_Causal_Effects/Causal_Effects.pdf.

Chapter 2

MOTHERS' EMPLOYMENT ATTRIBUTES AND USE OF PREVENTIVE CHILD HEALTH SERVICES

Abstract:

Background: More than half of children in the US do not receive the recommended number of preventive visits. Maternal employment attributes may be associated with receipt of pediatric preventive care by promoting time and monetary flexibility.

Purpose: This cross-sectional study examined whether attributes of maternal employment influence mothers' compliance with clinical preventive services for their children, as recommended by the American Academy of Pediatrics, the American Academy of Pediatric Dentistry, the US Preventive Services Task Force, and the Advisory Committee on Immunization Practices.

Methods: This analysis, conducted in 2013, used complex survey data from the Medical Expenditure Panel Survey and National Health Interview Survey years 2007-2010 (n=3,755) to examine whether paid leave and work intensity predict receipt of recommended well-child visits, general dental exams, preventive dental care, vision screening, obesity screening, and influenza vaccines among US children aged 0 to 17 years whose mothers are employed. Residual inclusion instrumental variable methods were used.

Results: Fewer than half of all children received the recommended number of well-child visits and dental care; only 14% of children received an influenza vaccine in the past year. Paid sick leave predicted an increase in the marginal probability of complying with recommended well-child visits (0.13; 95% CI: 0.032, 0.23), dental exams (0.31; 95% CI: 0.15, 0.47), preventive dental care (0.30; 95% CI: 0.11, 0.50), and influenza vaccines (0.17; 95% CI: 0.07, 0.27). The effects of other employment attributes on preventive care were limited.

Conclusions: Paid sick leave may address low compliance with pediatric preventive care.

Introduction

Despite clear guidance from the American Academy of Pediatrics (AAP), US Preventive Services Task Force (USPSTF), American Academy of Pediatric Dentists (AAPD) and the Advisory Committee on Immunization Practices (ACIP), many children in the United States do not receive recommended preventive health and dental services.[38,39] Recent studies demonstrate that fewer than half of all children received a well-child visit[40] or dental exam[39] in the previous 12 months.

The underutilization of pediatric preventive care represents a missed opportunity for child health. Well-child visits are the clinical service mechanism for delivering preventive care and immunizations; the most cost effective, lifesaving preventive intervention available.[41–44] Well-child visits promote screening and the early identification of a range of conditions. Preventive dental care identifies and reduces the incidence of dental caries,[45] the most common health problem among children.[46] Compliance with pediatric preventive care recommendations may reduce subsequent need for avoidable, expensive health care, including hospitalization,[47,48] emergency care,[47–50] and restorative dental care.[50]

Labor force participation among married women with children under 18 has steadily increased over the past 2 decades reaching 71.2% in 2008.[2] This increase has motivated considerable research about the association between maternal employment and family health outcomes. Extant research about this relationship is inconsistent, but some studies suggest that maternal employment and specific employment attributes, such as work intensity and paid time off, are associated with use of pediatric preventive care.[12,13,31,51] Children under 15 months whose mothers worked full time received 0.18 fewer preventive visits per year than children whose mothers did not work; further each additional hour of working time slightly reduced the number of visits.[51] There is also some indication that maternal paid sick leave entitlements may increase use of pediatric outpatient visits.[12]

Consistent with the Andersen-Newman model of health care utilization,[52] predisposing (e.g., older maternal age, child race/ethnicity, and younger child age), enabling (e.g., family income, marital status, maternal education) and need (e.g., health status) characteristics are shown to predict compliance with recommended pediatric preventive care.[5,40,51–59] Maternal workplace attributes may also enable use of pediatric preventive health services. Paid leave and work intensity bestow monetary and time flexibility that may offset the time and financial costs associated with preventive health care visits.[51,60] For example, working women who do not receive paid time off may have a disincentive to forgo income in favor of a pediatric preventive care visit.[13,51] Health care becomes another competing priority for parents who must choose to allocate limited resources, including time and wages.[12,13] Thus, families for whom foregone income represents greater opportunity costs, such as young, less educated, female-headed, lower-income, may receive the greatest benefit from workplace attributes that promote time and monetary flexibility.

This study examined the effects of paid sick leave, paid vacation leave, and work intensity on the use of pediatric preventive health services among US children aged 0 to 17 years. The clinical service outcomes were well-child visits, dental exams, preventive dental care, obesity screening, vision screening, and influenza vaccination. These services have been endorsed by the AAP, USPSTF, CDC (Advisory Committee on Immunization Practices), and the AAPD as effective interventions that improve child health outcomes.[61–64] It is hypothesized that paid leave entitlements and lower work intensity function as enabling factors to increase compliance with recommended pediatric preventive clinical care. This study also examined whether specific enabling variables (maternal marital status, family income, maternal education), moderated the association between paid sick leave and service utilization. Paid sick and vacation leave were highly correlated and past research has focused primarily on the effects of paid sick leave on service use;[31,51,65] therefore modification effects were only examined for paid sick leave.

Little is known about the relationship between maternal workplace attributes and well-child visits and there is virtually no evidence about whether employment attributes are associated with other preventive care services. Strengthening the evidence about how employment-related attributes influence child health

is critical to advocate for stronger workplace benefits that ensure the protection of workers and their families, particularly disadvantaged families.

Methods

Data Source

This study analyzed data in 2013 from the Medical Expenditures Panel Survey (MEPS) Household Component (years 2008-2010, Panels 13 and 14), and the National Health Interview Survey (NHIS) Linked Files (years 2007-2008). Both datasets are nationally representative of the non-institutionalized US population. MEPS is a panel survey that followed participants for 2 years; it contains information about most of the health care use outcomes relevant to this analysis, maternal employment attributes, and individual characteristics. MEPS data were linked to the NHIS for measures of annual, point-in-time receipt of the influenza vaccine.

Sample

The study sample (n=3755) comprises all children aged 0-17 years in the MEPS Household Component (HC) who resided with their mother and whose mothers were employed in the same job during all 5 panel survey rounds, to minimize bias due to negative employment attributes (n=4393 out of 10,288 children in full MEPS Panel 13 and 14 HC databases). Children whose mothers were self-employed were excluded (n=506) to avoid bias related to individual-level selection of workplace attributes. The influenza vaccine analysis sample (n=2487) includes all children from the MEPS HC sample who were linked to the NHIS sample and whose mothers remained employed at the same job between the NHIS data collection year and the third round of the MEPS panel survey (n=2,978 out of 10,288 children). For example, children in the MEPS Panel 14 (2009-2010) sample were included if they were linked to the NHIS 2008 sample and their mothers were employed at the same job when surveyed for both MEPS and NHIS.

Variables

Outcome variables: Six preventive service outcomes were examined; each coded as a binary variable based on whether the child met the requirement (1 = yes; 0 = otherwise).

1. Compliance with AAP recommended age-appropriate well-child visits for children aged 0-17 years. This variable was derived by totaling the number of preventive outpatient visits a child received during the panel survey. This figure was compared to the number of AAP recommended visits a child of that age (defined in months) should have received.

2. Receipt of a dental exam in the past 12 months (assessed during year 2) for children aged 1-17 years.

3. Receipt of preventive dental care defined as fluoride treatment, sealants, or teeth cleaning in the past year (assessed during year 2) in the past 12 months for children aged 1-17 years.

4. Compliance with USPSTF recommendations for the receipt of vision screening in the past 12 months (reported in panel 4) for children aged 3-6 years.

5. Compliance with USPSTF recommendations for receipt of BMI screening based on parent report that the doctor recorded the child's weight and height in the past 12 months (reported in panel 4) for children aged 6-17 years.

6. Receipt of the flu vaccine in the past 12 months for children aged 6 months-17 years. The MEPS survey sample uses the NHIS sample from the previous year. Accordingly, the MEPS Panel 13 (2008-2009) used the NHIS sample from 2007 and MEPS Panel 14 (2009-2010) used the NHIS sample from 2008. Therefore, data about the influenza vaccine outcome only exists for children in the MEPS Panel 13 survey who were born by December 31, 2007, or in MEPS Panel 14 who were born by December 31, 2008.

Predictor Variables: The primary predictor variables are derived from MEPS and measured in year 1. Receipt of maternal paid sick and paid vacation leave, measured during round 1, are coded as yes=1 and no=0. Work intensity was measured as the average number of hours worked per week by each mother in year 1 and categorized into low part time (>20 hours/week), high part time (<=20 to 34 hours/week), low

full time (=>35 to 50 hours/week) and high full time (50+ hours/week). The US Census Bureau and the American Community Survey define part time work as 1-34 hours per week.[66]

Modifying Variables: The modifying variables are maternal marital status (married/not married), family income (continuous variable categorized into quartiles to account for non-normal distribution), and maternal education (categorized as less than high school, high school graduate, more than high school).

Potential Confounding Variables: The confounding variables were selected from a review of the literature and the conceptual model. These include average child health status (continuous), child age (defined above), mother's race/ethnicity (White non-Hispanic/Other, Black non-Hispanic, Hispanic, Asian), mother's age (categorized as under 30, 30-34, 35-39, 40-44, 45+ years), mother's education (defined above), mother's marital status (defined above), number of children in the household (continuous), family income (defined above), and average father employment status (always, sometimes, never employed). The role of "father" was defined using family linking variables in the MEPS dataset. Categorical variables were included as indicators.

Instrumental Variables: Unobserved confounding may pose a significant challenge for this study as maternal characteristics and personal factors not captured in the available data may be associated with selection into jobs with different attributes related to paid leave or hours worked and use of pediatric preventive care. Instrumental variables (IV) are used to address unobserved confounding. IVs are associated with the predictor of interest and not the outcome variable and serve to randomize subjects across levels of the IV; thereby accounting for this bias. IVs must meet two requirements to justify their use: 1) the instrument is strongly related to the primary predictor and 2) is not related to the outcome, so as to not confound the relationship between any variable in the model and the outcome.

The IVs are the industry-specific mean of work intensity and paid sick and vacation leave. The IV for paid sick leave was constructed by estimating the mean proportion of sick leave by industry code. Industry-specific mean rates of compliance with each outcome were constructed and included as covariates in the analytical models. Alternative IVs were considered (e.g. industry code, occupation code,

retirement plan, and union membership status), but rejected due to concerns about missing data and lack of validity.

Statistical Analysis

Respondent characteristics are described using standard descriptive statistics. Logistic regression and a 2-stage residual inclusion IV analysis were used to assess the relationship between maternal employment attributes and use of preventive pediatric services. The logistic regression and IV models were specified using the same covariate vector. IV analysis assumptions were tested by 1) regressing each maternal employment attribute on the associated instrument and other covariates and 2) assessing the balance of each endogenous covariate across levels of each IV.

Paid sick and vacation leave were highly correlated (ρ=0.7) and modeled jointly as primary predictors in the second stage variables by including both residual terms. Work intensity was modeled separately as a categorical primary predictor, but controlled for paid sick and vacation leave. The second stage equations included the predictor (paid sick, paid vacation, work intensity), the predictor-specific residual from the first stage equation, the industry-specific mean of the specific outcome being tested, and all confounders. The presence of modification between paid sick leave and service use outcomes was tested by including an interaction term between sick leave and the modifying variables in the IV models.

Outcomes are presented as the marginal probability of receipt of pediatric preventive care comparing children of mothers with various levels of workplace benefits using the method of recycled predictions. Normal-based confidence intervals are presented; standard errors and 95% confidence intervals were estimated using 1,000 bootstrap replications. Statistical significance was assessed at α=0.05.

Models passed goodness of fit tests, including the Hosmer-Lemeshow, Pearson Correlation, and Pregibon Link tests. All analyses used STATA IC 13 (College Station, TX). Appropriate survey weights were applied to account for the complex sampling design.

No significant differences were found between the groups using sensitivity analyses to compare socioeconomic and demographic characteristics and employment factors among participants with and

without missing data. Further, fewer than 10% of the sample had any missing data; therefore, results of the complete case analysis are presented.

This study was deemed to be exempt from institutional review by the University of Washington Institutional Review Board.

Results

Table 1 describes participant socio-demographic characteristics, mean employment attributes, mean outcomes, and sample size for each outcome. Fewer than 50% of children complied with recommendations for well-child and dental care preventive visits; 14% of children received an influenza vaccine. More than 75% of children received the USPSTF-recommended screening services.

The results from the first stage equations (data not shown) demonstrate that each IV is strongly related to the primary predictor variables at $p<0.001$ and satisfies the first assumption. Balance of the endogenous covariates across levels of each maternal workplace attribute and levels of the associated IV was compared to understand whether the IVs address endogeneity. This assumption is not testable, but must be assumed to justify the use of each IV. All endogenous covariates achieved a greater balance across levels of the paid leave IVs. Most covariates achieved a greater balance across levels of the work intensity IV.

Tables 2 & 3 compare the marginal probabilities and associated confidence intervals constructed using bootstrapped standard errors of the logistic regression and the residual inclusion IV analyses. The IV models suggest that maternal employment attributes, especially paid sick leave, may drive the use of some preventive health services, including well child visits, dental exams, preventive dental care, and the influenza vaccine, when controlling for important socioeconomic, demographic, and employment factors. Children whose mothers receive paid sick leave are 13% to 30% more likely to receive some preventive services. Paid vacation exerts a significant negative effect on dental exams and receipt of the influenza vaccine and a positive effect on obesity screening. Higher work intensity negatively predicts receipt of

some pediatric preventive care, including preventive dental care and vision and obesity screening. The logistic regression models suggest that sick leave is associated with improved compliance with well-child visit and influenza vaccine recommendations and that work intensity may be associated with a reduction in compliance with well-child recommendations. No other significant associations were found.

The effect of paid sick leave differed significantly for some services by some of the enabling variables. These results (marginal probabilities, 95% CIs) are presented in Table 4; estimates are interpreted as the effect of paid sick leave on service outcomes in each enabling variable stratum compared with the reference group.

Discussion

This study examined the effect of paid sick leave, paid vacation leave, and work intensity on the use of preventive pediatric health services among children aged 0 to 17 years. Maternal workplace attributes, particularly paid sick leave, may be enabling factors influencing preventive child health service use. These findings support the conclusions of previous research, which suggest that specific maternal attributes are associated with child health service utilization.[12,13,31,51]

Paid sick leave increased the probability of complying with outpatient services such as well-child and dental visits, which generally require a caretaker to accompany the child; hence use of these services may be heavily influenced by time and monetary flexibility. In contrast, children may receive screening services in other settings, such as schools, explaining the lack of significance between maternal employment attributes and screening. School-based screening programs are commonplace in the United States and ensure that children receive recommended preventive services without requiring parents to take time away from work. As of 2010, 40% of states require and 18% of states recommend school-based obesity screenings.[67,68] More than[67,68] 80% of all states have some requirement for school vision screening.[69]

The effect of paid vacation leave on outcomes was weak, indicating that mothers may choose to use sick leave instead of vacation leave to address preventive health needs.

In general, higher maternal work intensity predicted lower use of some preventive services suggesting that the benefit of paid leave may be time versus monetary flexibility. In other words, parents do not use additional income gained from working more hours to offset the time costs of taking their children to preventive care visits by relying on a non-maternal caregiver to undertake the task. The number of women categorized as working more than 50 hours per week (n=323) and fewer than 20 hours per week (n=323) was small and this may have contributed to large standard errors and lack of statistical significance for most outcomes in these groups.

The logistic regression models provided weak, inconsistent estimates, which may suggest the presence of unobserved bias and support the use of IV statistical models. The IV analyses yielded higher proportions of statistically significant results compared with the logistic regression models, which is surprising as IV analyses tend to be inefficient. However, it is possible that the relationships between the unobserved variables in the logistic regression acted together to down-weight the estimates and increase the standard errors.

The results do not show a consistent moderating effect for any of the enabling variables. Instead of targeting organizational changes in female-dominated, low-income industries, broad-based policies that mandate paid sick leave for all workers may have important implications for increasing pediatric preventive care use in the United States.

Strengths include the use of a nationally representative US-based sample and the use of analytic techniques to account for unobserved confounding, which have not been extensively applied in related studies. Several important limitations must also be considered. First, the exclusion criteria may have induced some sample bias. Women who changed jobs during the survey were excluded making the results less representative because the sample only includes children whose mothers were more motivated to stay at their particular job for at least 2 years. The analytic approach improves causal interpretations, but has limitations that may challenge the interpretation of these findings. It is impossible to fully test all IV assumptions. Further, an IV analysis assumes a homogenous treatment effect across individual characteristics and may not yield accurate estimates for individuals with different covariate values.

Despite these limitations, the results provide convincing evidence that workplace policies may be important drivers of pediatric preventive health service use by providing time and financial flexibility for working parents. These findings indicate that paid sick leave may be one avenue to address low compliance with pediatric preventive care and provide justification for stronger organizational policies that protect workers and their families.

References

1. Schor EL. Rethinking Well-Child Care. *Pediatrics*. 2004;114(1):210–216. doi:10.1542/peds.114.1.210.

2. Edelstein BL, Chinn CH. Update on disparities in oral health and access to dental care for America's children. *Acad Pediatr*. 9(6):415–9. doi:10.1016/j.acap.2009.09.010.

3. Selden TM. Compliance with well-child visit recommendations: evidence from the Medical Expenditure Panel Survey, 2000-2002. *Pediatrics*. 2006;118(6):e1766–78. doi:10.1542/peds.2006-0286.

4. US Congress Office of Technology Assessment. *Healthy Children: Investing in the Future*. Washington, DC; 1988. Available at: http://www.fas.org/ota/reports/8819.pdf.

5. US Preventive Services Task Force. US Preventive Services Task Force. Available at: http://www.uspreventiveservicestaskforce.org/index.html.

6. Wilkinson J, Bass C, Diem S, et al. *Preventive Services Children and Adolescents*.; 2012. Available at: http://bit.ly.prevservkids0912.

7. Wagner JL, Herdman RC, Alberts DW. Well-child care: how much is enough? *Health Aff (Millwood)*. 1989;8(3):147–57. Available at: http://www.ncbi.nlm.nih.gov/pubmed/2507428. Accessed December 15, 2012.

8. Marinho VCC. Cochrane reviews of randomized trials of fluoride therapies for preventing dental caries. *Eur Arch Paediatr Dent*. 2009;10(3):183–91. Available at: http://www.ncbi.nlm.nih.gov/pubmed/19772849. Accessed August 12, 2013.

9. US Department of Health and Human Services. *Oral Health in America: A Report of the Surgeon General--Executive Summary*. Rockville, MD; 2000.

10. Hakim RB, Ronsaville DS. Effect of compliance with health supervision guidelines among US infants on emergency department visits. *Arch Pediatr Adolesc Med*. 2002;156(10):1015–20. Available at: http://www.ncbi.nlm.nih.gov/pubmed/12361448. Accessed July 17, 2012.

11. Hakim RB, Bye B V. Effectiveness of compliance with pediatric preventive care guidelines among Medicaid beneficiaries. *Pediatrics*. 2001;108(1):90–7. Available at: http://www.ncbi.nlm.nih.gov/pubmed/11433059. Accessed December 15, 2012.

12. Lee JY, Bouwens TJ, Savage MF, Vann WF. Examining the cost-effectiveness of early dental visits. *Pediatr Dent*. 28(2):102–5; discussion 192–8. doi:16708783.

13. Savage MF, Lee JY, Kotch JB, Vann WF. Early preventive dental visits: effects on subsequent utilization and costs. *Pediatrics*. 2004;114(4):e418–23. doi:10.1542/peds.2003-0469-F.

14. Bureau of Labor Statistics. *Employment characteristics of families in 2007*. Washington, DC; 2009. Available at: http://www.bls.gov/news.release/archives/famee_05272009.pdf.

15. Colle A, Grossman M. Determinants of pediatric care utilization. *J Hum Resour*. 1978;XIII(Supp 1978):115–158.

16. Hamman MK. Making time for well-baby care: the role of maternal employment. *Matern Child Health J*. 2011;15(7):1029–36. doi:10.1007/s10995-010-0657-9.

17. Berger LM, Hill J, Waldfogel J. Maternity leave, early maternal employment and child health and development in the US*. *Econ J*. 2005;115(501):F29–F47. doi:10.1111/j.0013-0133.2005.00971.x.

18. Vistnes JP, Hamilton V. The time and monetary costs of outpatient care for children. *Am Econ Rev*. 1995;85(2):117–21. Available at: http://www.ncbi.nlm.nih.gov/pubmed/10160522. Accessed July 17, 2012.

19. Andersen RM. Revisiting the behavioral model and access to medical care: does it matter? *J Health Soc Behav*. 1995;36(1):1–10. Available at: http://www.ncbi.nlm.nih.gov/pubmed/7738325. Accessed July 21, 2012.

20. Alio AP, Salihu HM. Maternal determinants of pediatric preventive care utilization among blacks and whites. *J Natl Med Assoc*. 2005;97(6):792–7. Available at: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2569499&tool=pmcentrez&rendertype=abstract. Accessed June 8, 2012.

21. Freed GL, Clark SJ, Pathman DE, Schectman R. Influences on the receipt of well-child visits in the first two years of life. *Pediatrics*. 1999;103(4 Pt 2):864–9. Available at: http://www.ncbi.nlm.nih.gov/pubmed/10103323. Accessed June 8, 2012.

22. Van Berckelaer AC, Mitra N, Pati S. Predictors of well child care adherence over time in a cohort of urban Medicaid-eligible infants. *BMC Pediatr*. 2011;11(1):36. doi:10.1186/1471-2431-11-36.

23. Ronsaville DS, Hakim RB. Well child care in the United States: racial differences in compliance with guidelines. *Am J Public Health*. 2000;90(9):1436–43. Available at: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1447611&tool=pmcentrez&rendertype=abstract. Accessed July 17, 2012.

24. Yu SM, Bellamy HA, Kogan MD, Dunbar JL, Schwalberg RH, Schuster MA. Factors that influence receipt of recommended preventive pediatric health and dental care. *Pediatrics*. 2002;110(6):e73. Available at: http://www.ncbi.nlm.nih.gov/pubmed/12456940. Accessed July 22, 2012.

25. Bardenheier B, Kong Y, Shefer A, Zhou F, Shih S. Managed care organizations' performance in delivery of childhood immunizations (HEDIS, 1999-2002). *Am J Manag Care*. 2007;13(4):193–200. Available at: http://www.ncbi.nlm.nih.gov/pubmed/17408339. Accessed July 30, 2012.

26. Bardenheier BH, Yusuf HR, Rosenthal J, et al. Factors associated with underimmunization at 3 months of age in four medically underserved areas. *Public Health Rep*. 2004;119(5):479–85. Available at: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1497657&tool=pmcentrez&rendertype=abstract. Accessed July 30, 2012.

27. Rolett A, Parker JD, Heck KE, Makuc DM. Parental employment, family structure, and child's health insurance. *Ambul Pediatr*. 1(6):306–13. Available at: http://www.ncbi.nlm.nih.gov/pubmed/11888420. Accessed June 8, 2012.

28. Friedman DE. Employer supports for parents with young children. *Future Child*. 2001;11(1):62–77. Available at: http://www.ncbi.nlm.nih.gov/pubmed/11712457. Accessed December 23, 2012.

29. Bright Futures/American Academy of Pediatrics. Recommendations for Preventive Pediatric Health Care. 2012. Available at: http://brightfutures.aap.org/pdfs/AAP Bright Futures Periodicity Sched 101107.pdf.

30. American Academy of Pediatrics. Prevention of influenza: recommendations for influenza immunization of children, 2007-2008. *Pediatrics*. 2008;121(4):e1016–31. doi:10.1542/peds.2008-0160.

31. Fiore AE, Shay DK, Broder K, et al. Prevention and control of seasonal influenza with vaccines: recommendations of the Advisory Committee on Immunization Practices (ACIP), 2009. *MMWR Recomm Rep*. 2009;58(RR-8):1–52. Available at: http://www.ncbi.nlm.nih.gov/pubmed/19644442. Accessed August 27, 2013.

32. US Preventive Services Task Force. *The Guide to Clinical Preventive Services*. Washington DC; 2012.

33. Rhoades JA, Vistnes JP. *Health Insurance Status of Hispanic Subpopulations in 2004: Estimates for the US Civilian Noninstitutionalized Population under Age 65: MEPS Statistical Brief # 143*. Washington, DC; 2006. Available at: http://meps.ahrq.gov/mepsweb/data_files/publications/st143/stat143.pdf.

34. Davis J. *School Enrollment and Work Status: 2011*. Washington, DC; 2012.

35. Linchey J, Madsen K. State requirements and recommendations for school-based screenings for body mass index or body composition, 2010. *Prev Chronic Dis*. 2011;8(5):A101.

36. Nihiser A, Lee S, Wechsler H, et al. Body mass index measurement in schools. *J Sch Heal*. 2007;77:651–671.

37. Prevent Blindness America. *State Mandated School Eye Exam and Vision Screening Laws*. Chicago, IL; 2007.

TABLE 2.1: Participant Characteristics (full sample n=3755; well-child sub-sample)

Socio-Demographic Characteristics	%[a] or mean
% Child Age	
0 to 5 years	32
6 to 10 years	26
11 to 14 years	23
15 to 17 years	19
% Mother Race/ethnicity	
Hispanic	18
Black non-Hispanic	14
Asian non-Hispanic	3
Other (including White)	65
% Children with both parents in household	
Mean Family Income at each Quartile	
First Quartile	$12,539
Second Quartile	$28,492
Third Quartile	$53,810
Fourth Quartile	$124,114
Mean Family Size	
% Mother Education	
> High School	7
= High School	43
< High School	50
% Mother Age	
>30 years	14
30 to 34 years	20
35-39 years	26
40-44 years	20
<40 years	20
% Mother Marital Status	
Married	74
Unmarried	26
% Father Employment Status	
Always employed	69
Sometimes employed	4
Never employed/not contributing to family income	27

Employment Attributes	%[a]

% Sick Leave	
Sick Leave	71
No Sick Lave	29
% Vacation Leave	
Vacation Leave	70
No Vacation Leave	30
% Work Intensity	
Low part time (1-19 hours/week)	7
High part time (20-34 hours/week)	19
Low full time (35-49 hours/week)	63
High full time (+50 hours/week)	11

Family Health Outcomes	**%[a]**	**N[b]**
% Achieved compliance with well-child visit recommendation (ages 0-17)	41	3755
% Received dental exam in past 12 months (ages 1-17)	47	3628
% Received preventive dental care (teeth cleaning, sealants, or fluoride) in past 12 months (ages 1-17)	47	3486
% Received BMI screening in the past 12 months (ages 6-17)	77	2470
% Received vision screening in the past 12 months (ages 3-6)	76	649
% Received flu shot in the past 12 months (ages 6 months-17)	14	2487

[a]% indicates the proportion of children in the sample who met the condition specified *[b]N indicates the full sample size*

TABLE 2.2: Marginal Probabilities (95% CI) from the Second Stage IV Residual Inclusion Model and from the Naïve Logistic Regression Model; Outpatient Services

	Well Child Visits		Dental Exam		Dental Preventive Care		Flu Shot	
	Logistic Model	IV Model	Logistic Model	IV Model	Logistic Model	IV Model	Logistic Model	IV Model
Paid Sick Leave	0.07***** (0.02, 0.13)	0.13* (0.03, 0.23)	0.02 (-0.02, 0.06)	0.31* (0.15, 0.47)	0.01 (-0.01, 0.04)	0.30* (0.11, 0.50)	0.05* (0.02, 0.09)	0.17* (0.07, 0.27)
Paid Vacation Leave	-0.06 (-0.15, 0.03)	-0.09 (-0.21, 0.03)	-0.003 (-0.02, 0.01)	-0.25* (-0.42, -0.07)	0.02 (-0.03, 0.07)	-0.03 (-0.17, 0.11)	-0.02 (-0.11, 0.05)	-0.37* (-0.44, -0.30)
Work Intensity								
Low part time (1-19 hours/week)	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
High part time (20-34 hours/week)	-0.06 * (-0.11, -0.01)	-0.15 (-0.37, 0.07)	-0.05 (-0.15, 0.04)	-0.07 (-0.40, 0.26)	-0.004 (-0.15, 0.14)	-0.37 (-0.82, 0.08)	0.03 (-0.04, 0.09)	-0.15 (-0.93, 0.63)
Low full time (35-49 hours/week)	-0.03 (-0.05, 0.001)	0.04 (-0.12, 0.52)	-0.10 (-0.20, 0.002)	-0.08 (-0.21, 0.21)	-0.05 (-0.14, 0.05)	-0.25* (-0.46, -0.03)	0.03 (-0.02 0.08)	0.02 (-0.99, 1.03)
High full time (+50 hours/week)	-0.09 (-0.19, 0.003)	-0.38 (-0.50, 0.26)	-0.12 (-0.23, 0.002)	-0.19 (-0.62, 0.24)	-0.04 (-0.16, 0.08)	-0.12 (-0.63, 0.39)	0.02 (-0.11, 0.15)	-0.15 (-0.58, 0.28)

**Indicates statistical significance at α=0.05*
CI=Confidence Interval

TABLE 2.3: Marginal Probabilities (95% CI) from the Second Stage IV Residual Inclusion Model and from the Naïve Logistic Regression Model; Screening Services

	Obesity Screening		Vision Screening	
	Logistic Model	IV Model	Logistic Model	IV Model
Paid Sick Leave	0.01 (-0.13, 0.16)	-0.07 (-0.32, 0.17)	0.002 (-0.05, 0.06)	-0.13 (-0.26, 0.01)
Paid Vacation Leave	0.06 (-0.12, 0.23)	0.36* (0.12, 0.59)	0.01 (-0.003, 0.03)	-0.03 (-0.38, 0.32)
Work Intensity				
Low part time (1-19 hours/week)	Ref	Ref	Ref	Ref
High part time (20-34 hours/week)	0.01 (-0.8, 0.10)	-0.63* (-0.99, -0.27)	0.04 (-0.06, 0.15)	-0.65 (-1.33, 0.04)
Low full time (35-49 hours/week)	-0.02 (-0.04, 0.03)	-0.42* (-0.80, -0.04)	-0.01 (-0.09, 0.09)	-0.43 (-0.99, 0.14)
High full time (+50 hours/week)	-0.02 (-0.11, 0.07)	-0.47* (-0.64, -0.14)	-0.07 (-0.21, 0.07)	-0.71* (-1.14, -0.28)

**Indicates statistical significance at α=0.05*
CI=Confidence Interval

TABLE 2.4: Marginal probabilities (95% CI) of the effect of paid leave on service use outcomes stratified by levels of family income, maternal education and maternal marital status

Paid sick leave	Well Child Visit	Dental Exam	Preventive Dental Care	BMI Screening	Vision Screening	Influenza Vaccine
Sick leave X Mother martial status (married vs. not)	-0.03 (-0.08, 0.02)	-0.06* (-0.07, -0.04)	0.07* (0.03, 0.11)	-0.07 (-0.36, 0.22)	0.01 (-0.04, 0.07)	0.23 (-0.10, 0.56)
Sick leave X Family income Q1-Ref	-	-	-	-	-	-
Sick leave X Family income (Q2 vs. Q1)	0.09 (-0.09, 0.26)	-0.01 (-0.07, 0.05)	-0.01 (-0.07, 0.05)	-0.24* (-0.35, -0.12)	0.06 (-0.10, 0.21)	-0.006 (-0.14, 0.13)
Sick leave X Family income (Q3vs. Q1)	0.02 (-0.08, 0.12)	-0.12* (-0.20, -0.04)	0.06 (-0.09, 0.21)	-0.23* (-0.45, -0.01)	-0.11 (-0.36, 0.14)	-0.06 (-0.23, 0.11)
Sick leave X Family income (Q4 vs. Q1)	0.11* (0.17, 0.05)	-0.23* (-0.29, -0.15)	-0.08* (-0.16, -0.002)	-0.20* (-0.30, -0.10)	-0.06 (-0.56, 0.44)	-0.03 (-0.23, 0.16)
Sick leave X Mother education less than high school-Ref	-	-	-	-	-	-
Sick leave X Mother education (high school graduate vs less than high school)	-0.16* (-0.21, -0.10)	0.01 (-0.05, 0.06)	0.28* (0.36, 0.20)	0.10 (-0.02, 0.21)	0.10* (0.002, 0.19)	-0.08 (-0.23, 0.07)
Sick leave X Mother education (more than HS vs less than high school)	-0.11 (-0.29, 0.06)	-0.06 (-0.12, 0.004)	0.26* (0.23, 0.28)	0.15* (0.07, 0.23)	0.009 (-0.06, 0.04)	-0.11 (-0.26, 0.03)

**Indicates statistical significance at α=0.05*

CI=Confidence Interval; Q1, Q2, Q3, Q4 refer to quartiles of family income

Chapter 3

WORKPLACE ENVIRONMENT AND WORKING FROM HOME INFLUENCE DEPRESSIVE SYMPTOMS AMONG EMPLOYED WOMEN WITH YOUNG CHILDREN

Abstract

Introduction: This study examines the causal impact of specific workplace policies on changes in depressive symptoms among working women with young children between 6 and 24 months of age.

Methods: This study uses data from the NICHD (National Institute of Child Health and Human Development) Study of Early Child Care and Youth Development (SECCYD) collected between 1991 and 1993 to examine the effects of work intensity, work schedule (night/day/variable), schedule flexibility, working from home, and the workplace environment on changes in depressive symptoms among a national US sample of 570 women who returned to work within 6 months after childbirth. Depressive symptoms were assessed using the CES-D score. The treatment effect was estimated using fixed effects regression models.

Results: Working from home and the psychosocial work environment were associated with within-individual changes in depressive symptoms between 6 and 24 months post childbirth. Women who worked from home reported a statistically significant decrease in depression scores over time (β=-1.60, SE=0.53, p=0.002). Women who reported a one-unit increase in job concerns experienced, on average, a 2-point increase in depression scores over time (β=1.91, SE=0.43, p<0.01). Work intensity, work schedule and schedule flexibility were not associated with changes in depressive symptoms.

Discussion: This study is one of the few to use longitudinal data and causal-inference techniques to examine whether specific workplace attributes influence depressive symptoms among women with young children. The results indicate that working from home and positive workplace environments may be associated with decreased depressive symptoms. Incorporating these elements into the workplace may improve mental health among women who transition back to work soon after childbirth.

Introduction

In the United States, almost 60% of employed first-time mothers return to work within 12 weeks after childbirth,[70,71] however studies indicate that women may need one to two years postpartum to fully recover physically and emotionally from the birth of a child.[14,70] Maternal employment can have a beneficial impact on the mental health of women with young children through improved access to financial resources, social support and perceived personal competency.[72–75] However, these effects may depend on whether work-related attributes support family life once women transition back to work.[15,21,76] A major struggle for working women is the balance between work and family and, for many, difficulty coping with this stress can lead to depression.[14,21,22,76] Depression among mothers with young children can have serious consequences, including disturbed mother-infant relationships and impaired infant cognitive and emotional development.[77]

Family-friendly employment attributes—including flexible, day-time work schedules, paid leave (maternity leave, paid sick leave), and financial assistance (health care insurance, childcare subsidies)[60] – have been shown to improve the well-being of working parents.[10,15] Specifically, studies suggest that family-friendly workplace attributes ease a woman's transition back to work and are associated with better mental health outcomes among some new mothers by decreasing work-life conflict and reducing stress associated with balancing multiple roles.[10,14,21,22,76,78] Positive attributes, such as workplace flexibility in the form of flex-time, job-sharing, and working standard schedules, may be associated with reduced work/family conflict and improved employee well-being.[20,78–80] Negative attributes may be associated with harmful consequences for mental health. For example, lack of schedule control is associated with higher degrees of psychological distress among women with young families.[10,16,25] Working a nonstandard schedule and high work intensity can contribute to poor mental health outcomes through increased family conflict because parents may have more difficulty coordinating family schedules and participating in family activities and events.[81] Non-standard schedules may also directly contribute to psychological distress through distorted sleeping and eating patterns and disruption of the circadian

rhythm.[82] Stressful work environments place high psychological demands on workers resulting in high levels of strain that can manifest in negative mental health outcomes, such as depression, for employed women with young children.[10,16,18]

Pearlin's stress process theory[17] guides this analysis and has been used in other studies investigating maternal depression.[16] This model posits that mental well-being is a complex process that is influenced by sources of stress that manifest in negative outcomes, such as depressive symptoms.[17] Sources of stress involve adverse stressful life events and ongoing life pressures, such as negative employment conditions.[16] "Mediating resources" minimize the effect of stressful circumstances on negative stress outcomes, thereby moderating the relationship between stressors and depressive symptoms.[17] For example, some social and economic factors function as buffers against stress and may moderate the relationships between negative workplace attributes and maternal depressive symptoms. Social support has been shown to promote improved mental health among working women in the year after birth.[10,16,21,25,26,76,83,84] Being married and having higher socioeconomic status also predict lower depressive symptoms among mothers.[77]

Few studies have analyzed the role of specific workplace attributes on mental health outcomes among women with young children[14] because available data are limited. Most studies have used cross-sectional designs, they had small samples, they did not follow women for more than a year, or they were composed primarily of middle-class, well-educated, White women.[14,76,85,86] This analysis used longitudinal fixed effects regression to investigate these relationships in a relatively large sample of employed women followed for 2 years after giving birth.

Employment-related attributes, including non-daytime work schedule, schedule inflexibility, high work intensity, inability to work from home, and a stressful work environment are hypothesized to be sources of stress that increase depressive symptoms among women with young children. Further, it is expected that social support, family income, and partnership status will moderate the relationship between

workplace attributes and depressive symptoms. The results from this study could inform the development and implementation of family-friendly workplace policies in the United States.

Methods

Data Source

This analysis used data collected from months 1 to 24 post birth from the NICHD (National Institute of Child Health and Human Development) Study of Early Child Care and Youth Development (SECCYD) dataset, a longitudinal survey designed to explore the effects of non-maternal child care on child health and development outcomes. The SECCYD recruited 1,364 children born in 1991 in 10 different US cities and followed them from 1 month of age until they reached 15 years of age.[87] This analysis was deemed exempt from institutional review by the University of Washington Institutional Review Board.

Sample

The analysis sample included all women who were employed and at work (i.e. not on leave) at 6, 15 and 24 months after birth (n=570)—thus including women employed part-time, but excluding those who were students only. This focus ensured that all women in the sample were exposed to work-related attributes at all time-points.

Variables

Outcome Variable: The primary outcome, depressive symptoms among women who were employed when their study child was 6 to 24 months old, was measured continuously with the Center for Epidemiologic Studies Depression Scale (CES-D) scores obtained at months 1, 6, 15 and 24. The majority of women in the sample had not returned to work within one month after birth and so depression score at month 1 was selected as the baseline measure. The CES-D is a 20-item instrument that asks respondents how they felt in the past week, on a Likert scale ranging from 0-3 (and a total score ranging from 0 to 60). The CES-D and has been shown to reliably detect depressive symptoms.[88]

Predictor Variables:

Maternal workplace attributes, based on employment information gathered through household interviews with employed mothers at months 6, 15 and 24, were examined as follows:

1) Average number of self-reported hours worked per week was categorized into low part-time (1-19 hours), high part-time (20-34 hours), low full-time (35-49 hours) and high full-time (50+ hours). The US Census Bureau and the American Community Survey define part time work as 1-34 hours per week.[66]
2) Work schedule categorized as "dayshift" (7am-7pm, reference), "not dayshift" (7pm-7am), or "variable schedule".
3) Schedule flexibility based on the item "how flexible are your work hours?" and categorized as "very flexible" (reference), "fairly flexible", "minimally flexible", and "not flexible".
4) Job stress assessed using the Job Role Quality Scale,[89] a 21-item measure administered at months 15 and 24 that captured women's positive and negative experiences at work, including opportunity for advancement, recognition, and supervisor support. The potential range for this scale was +3 to -3 with more positive values indicating higher levels of job stress. The scale demonstrated high internal consistency (Cronbach's alpha=0.8) and validity.[90] Job stress was included in the models as a continuous variable; higher scores on the job stress index may suggest that women are exposed to more psychological demands in the workplace.
5) Average weekly number of hours worked from home categorized into a binary variable (works from home/does not work from home); and alternatively examined as a categorical variable to yield a dose-response measure— "1" (1-8 hours, reference), "2" (9-16 hours), "3" (17-24 hours), "4" (25-32 hours), and "5" (more than 32 hours). The alternative classification of working from home was intended to capture the number of typical work-length days during the week that an individual spent working from home and was used in models restricted to those women who worked from home (*n*=132, 23% of sample).

Moderating Variables: This analysis tested "mediating resources" defined by Pearlin as potential moderators of associations between workplace characteristics and maternal depression. These variables include social support, marital status, and family income-to-needs ratio.

1. Social support was assessed using the Relationships with Other People instrument[89], an 11-item (1 to 6 Likert scale) tool administered at months 6, 15, and 24. This variable is categorized into quartiles of social support averaged over the 3 time-points. The items, which are based on Weiss's conceptualization of the functions of social relationships,[91] demonstrated high internal consistency (Cronbach's alpha >0.9) and validity.
2. Partnership status was included as a binary variable (partnered/not-partnered).
3. Family income-to-needs ratio is a measure of all household-level income sources divided by the poverty threshold for that household size; it is included as a categorical variable defined by quartiles.

Other Covariates: Covariates were determined apriori and selected based on a review of the literature. Baseline variables included depression score at month 1 (modeled continuously), partner relationship score (modeled continuously), pregnancy intention (yes, intended to become pregnancy/no, did not intend to become pregnant), and child birth-weight (measured grams and modeled continuously). Socioeconomic and demographic factors included mother's age (measured in years and modeled categorically 18-24, 25-20, 30-34, and 35+), race/ethnicity (White/Black/ Hispanic/Other), and education (less than high school, completed high school, completed more than high school). Time-varying covariates included a count of the number of children living in the home, family income-to-needs ratio (as described above), whether changes in employment were due to work-related reasons (yes/no), partner employment status (as described below) and hours worked (as described below), other sources of life and parenting stress not related to employment (modeled continuously),[77] partner satisfaction with maternal employment (as described below),[14] infant health status (measured in four categories: excellent, good, fair, and poor) and dichotomized for this analysis (excellent or good/ fair or poor), mother's health status

(same as for child health), social support, (as described above), partnership status (as described above), and whether both parents lived in the household (yes, both parents live in the house/no). Partner employment status was defined as "partner/spouse employed", "partner/spouse not employed", and "not partnered" (reference). Partner satisfaction with maternal employment decisions was defined as "partner/spouse satisfied", "partner/spouse not satisfied", and "not partnered" (reference). The average number of hours worked per week by a partner was included in the models as a continuous variable and was coded "0" if the mother was not partnered or if the partner did not work. Partnership status was captured in the model as the reference category for the partner employment and partner satisfaction variables. Work/life conflict was not included in the model as it is a strong mediator of the relationship between maternal workplace attributes and depressive symptoms.

Enhancing causal inference

Causal inference techniques attempt to address unobserved heterogeneity that occurs in most observational studies due to the inability to measure all confounding factors.[34,92] In this instance, it is likely that unobserved time-fixed factors that influence a woman's choice of employment may be associated with mental health. For example, the inability to cope with chronic sleep deprivation (unobserved in dataset) may increase depressive symptoms and prompt a woman to seek a workplace that has a flexible and supportive environment. In the presence of unobserved heterogeneity, OLS regression will produce biased estimates. In relatively short longitudinal studies, individual fixed effects regression can produce causal estimates of how changes in the predictor influence changes in the outcome by differencing out all observed and unobserved time-fixed, individual-level characteristics, such as gender, reaction to sleep deprivation, individual motivations, family characteristics, etc. This method assumes that all individual-level time-varying confounders are accounted for in the analysis. The fixed effect parameter represents the within-individual effect or the average change in the outcome due to the treatment observed in an individual over time. Our primary interest is the within-individual effect versus the between-individual effects, which are equivalent to estimates produced by OLS regression.

Statistical Analysis

All analyses used STATA IC 13. Respondent characteristics are described using standard descriptive statistics. Missing data were minimal (less than 1% for most covariates and approximately 10% for 5 covariates) and were addressed by imputing values collected in subsequent waves for variables with high within-individual correlation or by imputing the median sample value of that variable for each time point for variables with low within-individual correlation or that were only collected at one time point (e.g. baseline covariates). There was minimal evidence suggesting that participant characteristics contributed to missing data patterns. All models were repeated without this imputation, with no substantive differences relative to the reported findings. The data were examined for outliers and visual inspections of model residuals were conducted. One outlier variable was found and corrected in the income-to-needs ratio variable in month 15. Covariate correlations and univariate and bivariate trajectories were examined.

Fifty percent of the variance in depression was attributable to between cluster variation (ICC=0.50) indicating the need to account for individual-level clustering. Therefore, linear fixed effects models were used to assess whether individual-level changes in employment attributes from 6-24 months post birth resulted in changes in depressive symptoms over time. We used a random effects framework and included the individual mean over time of each workplace attribute in the model (i.e. between-individual effects). Using this method, the variance attributed to the within- and between-treatment effects can be partitioned. Within- individual and between-individual treatment effects and associated standard errors are presented.

The relationships between each predictor and depression were analyzed separately in models that included the same covariate vector specified above with the following exceptions: a) the workplace flexibility predictor model also controlled for work intensity and work from home; b) the work from home predictor model controlled for work intensity; and c) the job stress predictor model controlled for work intensity, schedule flexibility, and work from home. In all models, an interaction term between each

primary predictor and social support, income-to-needs ratio, and partnership status was tested with partial f-tests. Significance for all treatment effects and interaction terms was defined at $\alpha<0.01$and $\alpha<0.05$ and $\alpha<0.10$.

Model fit was assessed using the Hosmer-Lemeshow test applied to the longitudinal models and to cross-sectional models at each time point. The mean depression score was not normally distributed (skew=1.6, kurtosis=6.1) resulting in heteroscedastic errors. Therefore, sensitivity analysis models were run using generalized linear techniques for longitudinal data to account for heteroscedastic error terms.

Results

The socio-demographic characteristics of the study sample are summarized in Table 1. Compared with the general population of US women in 1991, the study sample included more non-Hispanic White women (85% vs. 75%) and fewer Hispanic (3% vs. 9%) and non-Hispanic Black women (8% vs. 12%).[93] On average, mean household income was slightly higher compared with the general US population in 1991 (average US household income 1991 was $43,056[94]) which is expected as this sample comprises approximately 65% of families from dual income households (versus 59.1% in the general population in 1991[95]) Also, sample participants had higher levels of education compared with working women aged 25-64 in the general US population in 1991.[95]

Table 2 shows the means and proportions of depression scores, workplace attributes, and the potential moderating variables at each time-point. The summary statistics for all variables remained fairly consistent, except for family income-to-needs ratio and depression score. Depression scores increased slightly over time, but were highest at month 1 possibly due to the effects of hormonal changes and sleep deprivation. Figure 3.1 displays the growth curve for depression scores between months 1 and 24.

Table 3 reports the correlations between maternal depression and each workplace attribute across time. Inter-correlations between variables were low; correlations within variables across time were relatively high.

Table 4 reports average effects of changes in workplace attributes between 6 and 24 months post-birth on changes in depressive symptoms within women (within-effects) and average changes in workplace attributes over time on differences in depressive symptoms between women (between-effects). The within-individual effect coefficients show that moving from not working from home to working from home decreased an individual's depression score by a mean of 1.60 point, a 0.22 change in the standard deviation of the overall sample depression score. One unit increase in job stress increased depression scores by a mean of 1.91 points in this sample; this is equivalent to a 0.26 change in the standard deviation of the sample depression score. Changes in hours worked per week (linear and categorical variable forms), work schedule, schedule flexibility and number of hours an individual worked from home were not associated with changes in depression score at α=0.05.

In general, the between-individual effects demonstrated opposite trends and were less efficient compared with the within-individual effects. Work from home significantly increased depression scores among women when controlling for time-varying and time-fixed covariates, corresponding to a 0.30 change in the standard deviation of the sample depression score.

The socioeconomic factors did not moderate the relationships between workplace attributes and maternal depression.

All models passed the goodness-of-fit tests. Sensitivity analyses using generalized linear models to account for heteroscedastic errors produced similar point estimates and lower standard errors for most models compared with the fixed effects models. The results between the two sets of models did not differ except that in the generalized linear models the coefficient for non-day shift work was statistically significant (β=0.80, *SE*=0.37, *p*=0.03). The results from the generalized linear models are not reported in tables.

Discussion

We investigated whether workplace attributes were predictive of depressive symptoms among women with young children and conclude that some workplace attributes may be sources of stress for women that

negatively influence mental well-being. Our results show that job stress may worsen depressive symptoms and that working from home may improve depressive symptoms among working women with young children.

The effect of job stress is consistent with what has been shown in previous research—lower schedule autonomy,[16,19,25] psychological demands,[16] and lack of perceived control,[16] all components of a stressful workplace environment, negatively influence the mental health of women with young children. The results from our study contradict findings from past studies that found no association between working from home and depressive symptoms and concluded that the ability to work from home may blur the boundaries between work and home thereby increasing work/family conflict.[25] In contrast, we found that working from home lowered depressive symptoms suggesting that working from home may provide tangible time benefits for new mothers by reducing commutes and making more time available to spend with their children at home. Our results show no threshold effect of hours spent working from home on depressive symptoms, indicating that the critical component of working from home may be the ability to work from home when needed as opposed to the total number of hours spent working from home. We also considered the possibility of reverse causality—that depressed women may be more likely to choose to work from home. However, our results dispute this potential hypothesis as working from home was associated with lower depression scores; if depressed women chose to work from home we would have observed higher depression scores among these women.

Working a non-standard schedule is associated with work/family conflict,[79] but our study is the first to consider the direct association between work schedule and mental health. While our results do not demonstrate a strong effect of work schedule on depressive symptoms, the results from the sensitivity analysis using generalized linear models suggest that non-day time work (between 7pm and 7am) may be associated with more depressive symptoms. Extant research has also not considered the isolated effect of (paid) work intensity on depression score, though the effect of total paid and unpaid (i.e. household chores) workload is associated with depressive symptoms among women 6 months after childbirth.[25] It is

possible that unpaid versus paid workload is the element that influences mental health. These data were not contained in the SECCYD and we were unable to test this hypothesis.

The between-individual estimates were inconsistent compared with the within-individual estimates. Unobserved confounding may have biased the between-individual treatment effects and may explain this discrepancy.

This is one of the few studies to use longitudinal data and causal inference techniques to examine whether specific workplace attributes influence depressive symptoms for women with young children. This analysis remedies some of the shortcomings in prior work by using information from a rich, longitudinal database that captures depression status, workplace characteristics, and a number of other life stressors at multiple time points after birth among a relatively large sample of employed women. Moreover, it is the only study to examine the moderating role of important socioeconomic factors on the relationship between workplace attributes and depression.

Several limitations must be considered. The NICHD SECCYD dataset is not nationally representative. It contains a higher proportion of non-minority, employed mothers who have higher levels of education and family income than women in the general US population. The data were collected in 1991 and represent treatment effects at this time that may or may not represent current effects. Further, selection bias may be present as past depressive symptoms, predictive of future depressive symptoms, may influence the decision to return to work and the choice of work environment. In addition, the dataset does not contain a measure of depression status when participants returned to work; instead we relied on baseline depression status at month 1 which was quite different from the subsequent depression scores. This is problematic because depressive symptoms may be associated with the amount of time that a woman has been back at work or duration of leave;[72,74,84,96] and these factors may also be related to employment decisions. Also, there was minimal information about employment attributes during pregnancy making it impossible to assess whether some women self-selected out of a prior workplace or did not return to work because of

negative employment attributes; thus, our sample may contain a higher proportion of new mothers exposed to more positive workplace attributes than those in the general population.

The fixed effects approach does not account for unobserved time-varying heterogeneity, but this factor may be less of a threat to causal inference as the analysis time horizon was relatively short and the dataset contained information about many potential sources of time-varying confounders, including infant health status, partner support, and partner employment status. Further, most employment attributes, such as workplace environment, flexibility, and work schedule are not easily changed by individuals once they have elected to participate in a job and change in employment status due to negative employment attributes was controlled for in all models. Therefore, we do not anticipate that the potential limitations of the fixed effects approach biased the reported estimates.

Conclusion

Women face tremendous challenges after the birth of a child and contextual factors, such as workplace attributes, may have important implications for mental health.[10,15] Policy makers and employers should consider how to best support working mothers with young children by incorporating family-friendly attributes into the workplace environment. Such organizational policies could include allowing flex-time, working from home, and educating supervisors in techniques to promote positive workplace environments. These elements may effectively support women who transition back to work shortly after birth and have important implications for improved mental well-being.

References

1. Dye JL. Fertility of American Women. *Curr Popul Reports*. 2005;P20-555(December).

2. Shepherd-Banigan M, Bell J. Paid leave benefits of working mothers. *Matern Child Health J*. 2014;18(1):286–95.

3. Killien MG, Habermann B, Jarrett M. Influence of employment characteristics on postpartum mothers' health. *Women Health*. 2001;33(1-2):63–81. Available at: http://www.ncbi.nlm.nih.gov/pubmed/11523641. Accessed July 25, 2012.

4. Chen CH. Association of work status and mental well-being in new mothers. *Kaohsiung J Med Sci*. 2001;17(11):570–5. Available at: http://www.ncbi.nlm.nih.gov/pubmed/11852464. Accessed July 25, 2012.

5. Mayberry LJ, Horowitz JA, Declercq E. Depression symptom prevalence and demographic risk factors among U.S. women during the first 2 years postpartum. *J Obstet Gynecol Neonatal Nurs*. 2007;36(6):542–9. Available at: http://www.ncbi.nlm.nih.gov/pubmed/17973697. Accessed July 25, 2012.

6. Miyake Y, Tanaka K, Sasaki S, Hirota Y. Employment, income, and education and risk of postpartum depression: the Osaka Maternal and Child Health Study. *J Affect Disord*. 2011;130(1-2):133–7. Available at: http://www.ncbi.nlm.nih.gov/pubmed/21055825. Accessed July 25, 2012.

7. Stansfeld S, Candy B. Psychosocial work environment and mental health--a meta-analytic review. *Scand J Work Environ Health*. 2006;32(6):443–62. Available at: http://www.ncbi.nlm.nih.gov/pubmed/17173201. Accessed July 25, 2012.

8. Nichols MR, Roux GM. Maternal perspectives on postpartum return to the workplace. *J Obstet Gynecol Neonatal Nurs*. 33(4):463–71. Available at: http://www.ncbi.nlm.nih.gov/pubmed/15346672. Accessed June 19, 2012.

9. Strazdins L, Shipley M, Broom D. What does family-friendly really mean? Wellbeing, time and quality of parents' jobs. *Aust Bull Labor*. 2007. Available at: http://www.thefreelibrary.com/What does family-friendly really mean? Wellbeing, time, and the...-a0173643846.

10. Grice MM, Feda D, McGovern P, Alexander BH, McCaffrey D, Ukestad L. Giving birth and returning to work: the impact of work-family conflict on women's health after childbirth. *Ann Epidemiol*. 2007;17(10):791–8. Available at: http://www.ncbi.nlm.nih.gov/pubmed/17719242. Accessed July 25, 2012.

11. Grice MM, McGovern PM, Alexander BH, Ukestad L, Hellerstedt W. Balancing work and family after childbirth: a longitudinal analysis. *Womens Health Issues*. 2011;21(1):19–27. Available at: http://www.ncbi.nlm.nih.gov/pubmed/21185988. Accessed July 25, 2012.

12. Beck CT. Predictors of postpartum depression: an update. *Nurs Res*. 50(5):275–85. Available at: http://www.ncbi.nlm.nih.gov/pubmed/11570712. Accessed December 7, 2011.

13. Friedman DE. Employer supports for parents with young children. *Future Child*. 2001;11(1):62–77. Available at: http://www.ncbi.nlm.nih.gov/pubmed/11712457. Accessed December 23, 2012.

14. Cooklin AR, Canterford L, Strazdins L, Nicholson JM. Employment conditions and maternal postpartum mental health: results from the Longitudinal Study of Australian Children. *Arch Womens Ment Health*. 2011;14(3):217–25. doi:10.1007/s00737-010-0196-9.

15. Frye NK, Breaugh JA. Family-Friendly Policies, Supervisor Support, Work-Family Conflict, Family-Work Conflict, and Satisfaction: A Test of a Conceptual Model. *J Bus Psychol*. 2004;19(2):197–220. doi:10.1007/s10869-004-0548-4.

16. Allen TD. Family-Supportive Work Environments: The Role of Organizational Perceptions. *J Vocat Behav*. 2001;58(3):414–435. doi:10.1006/jvbe.2000.1774.

17. Carlson DS, Grzywacz JG, Ferguson M, Hunter EM, Clinch CR, Arcury TA. Health and turnover of working mothers after childbirth via the work-family interface: an analysis across time. *J Appl Psychol*. 2011;96(5):1045–54. doi:10.1037/a0023964.

18. Joyce K, Pabayo R, Critchley JA, Bambra C. Flexible working conditions and their effects on employee health and wellbeing. *Cochrane Database Syst Rev*. 2010;(2):CD008009. doi:10.1002/14651858.CD008009.pub2.

19. Dagher RK, McGovern PM, Alexander BH, Dowd BE, Ukestad LK, McCaffrey DJ. The psychosocial work environment and maternal postpartum depression. *Int J Behav Med*. 2009;16(4):339–46. Available at: http://www.ncbi.nlm.nih.gov/pubmed/19288209. Accessed July 25, 2012.

20. Dagher RK, McGovern PM, Dowd BE, Lundberg U. Postpartum depressive symptoms and the combined load of paid and unpaid work: a longitudinal analysis. *Int Arch Occup Environ Health*. 2011;84(7):735–43. Available at: http://www.ncbi.nlm.nih.gov/pubmed/21373878. Accessed July 25, 2012.

21. Staines GL, Pleck JH. Nonstandard work schedules and family life. *J Appl Psychol*. 1984;69(3):515–523. doi:10.1037//0021-9010.69.3.515.

22. Kolla BP, Auger RR. Jet lag and shift work sleep disorders: how to help reset the internal clock. *Cleve Clin J Med*. 2011;78(10):675–84. doi:10.3949/ccjm.78a.10083.

23. Nieuwenhuijsen K, Bruinvels D, Frings-Dresen M. Psychosocial work environment and stress-related disorders, a systematic review. *Occup Med (Lond)*. 2010;60(4):277–86. doi:10.1093/occmed/kqq081.

24. Pearlin LI, Lieberman MA, Menaghan EG, Mullan JT. The stress process. *J Health Soc Behav*. 1981;22(4):337–56. Available at: http://www.ncbi.nlm.nih.gov/pubmed/7320473. Accessed July 25, 2012.

25. Killien MG. The role of social support in facilitating postpartum women's return to employment. *J Obstet Gynecol Neonatal Nurs*. 2005;34(5):639–46. doi:10.1177/0884217505280192.

26. Gjerdingen DK, Chaloner KM. The relationship of women's postpartum mental health to employment, childbirth, and social support. *J Fam Pract*. 1994;38(5):465–72. Available at: http://www.ncbi.nlm.nih.gov/pubmed/8176344. Accessed July 25, 2012.

27. McGovern P, Dowd B, Gjerdingen D, Moscovice I, Kochevar L, Lohman W. Time off work and the postpartum health of employed women. *Med Care*. 1997;35(5):507–21. Available at: http://www.ncbi.nlm.nih.gov/pubmed/9140338. Accessed June 19, 2012.

28. Gjerdingen DK, Yawn BP. Postpartum depression screening: importance, methods, barriers, and recommendations for practice. *J Am Board Fam Med*. 2007;20(3):280–8. doi:10.3122/jabfm.2007.03.060171.

29. McGovern P, Dowd B, Gjerdingen D, et al. Mothers' health and work-related factors at 11 weeks postpartum. *Ann Fam Med*. 5(6):519–27. doi:10.1370/afm.751.

30. NICHD Early Child Care Research Network. Nonmaternal Care and Family Factors in Early Development: An overview of the NICHD Study of Early Child Care. *J Appl Dev Psychol*. 2001;22:457–492.

31. Weissman MM, Sholomskas D, Pottenger M, Prusoff BA, Locke BZ. Assessing depressive symptoms in five psychiatric populations: a validation study. *Am J Epidemiol*. 1977;106(3):203–14. Available at: http://www.ncbi.nlm.nih.gov/pubmed/900119. Accessed July 24, 2012.

32. Davis J. *School Enrollment and Work Status: 2011*. Washington, DC; 2012.

33. Marshall NL, Barnett RC. Work-family strains and gains among two-earner couples. *J Community Psychol*. 1993;21(1):64–78. doi:10.1002/1520-6629(199301)21:1<64::AID-JCOP2290210108>3.0.CO;2-P.

34. Barnett RC, Davidson H, Marshall NL. Physical symptoms and the interplay of work and family roles. *Health Psychol*. 1991;10(2):94–101. Available at: http://www.ncbi.nlm.nih.gov/pubmed/2055215. Accessed April 23, 2014.

35. Weiss R. *The provisions of social relations. In Doing unto others*. (Rubin Z, ed.). Englewood Cliffs, NJ: Prentice-Hall; 1974:17–26.

36. Pearl J. Causal inference in statistics: An overview. *Stat Surv*. 2009;3:96–146. doi:10.1214/09-SS057.

37. Shadish W, TD C, Campbell D. *Experimental and quasi-experiemental designs for generalized causal inference*. Boston: Houghton Mills; 2002.

38. Population Esimates Program PD. *Resident population estimates of the United States by sex, race, and Hispanic origin: April 1, 1990 to July 1, 1999 with short-term projection to November 1, 2000*. Washington, DC; 2001. Available at: http://www.census.gov/popest/data/national/totals/1990s/tables/nat-srh.txt.

39. US Census Bureau. *Mediam Income for 4-Person Families, by State*. Washington, DC; 2013. Available at: https://www.census.gov/hhes/www/income/data/statistics/4person.html.

40. BLS Reports. *Women in the Labor Force: A Databook*. Washington, DC; 2013. Available at: http://www.bls.gov/cps/wlf-databook-2012.pdf.

41. Cooklin AR, Rowe HJ, Fisher JRW. Employee entitlements during pregnancy and maternal psychological well-being. *Aust N Z J Obstet Gynaecol*. 2007;47(6):483–90. doi:10.1111/j.1479-828X.2007.00784.x.

42. Chatterji P, Markowitz S. Family leave after childbirth and the mental health of new mothers. *J Ment Health Policy Econ*. 2012;15(2):61–76. Available at: http://apps.webofknowledge.com.offcampus.lib.washington.edu/full_record.do?product=WOS&search_mode=GeneralSearch&qid=10&SID=1FlkK7Cg4F53KMmibBg&page=1&doc=1. Accessed July 28, 2012.

TABLE 3.1: Participant demographics

Socio-demographic Characteristics	% or mean, SD
Maternal age (mean, SD, range)	29.6; 4.7; 18-43
Child's birth weight in grams (mean, SD, range)	3505; 523.4; 2000-5200
Number of children in household (mean, SD, range)	1.8; 1.0; 1-13
Total family income at baseline (mean, median)	$60,185, $50000
Maternal race/ethnicity (%)	
White	85
Black	8
Hispanic	3
Other	4
Maternal education (%)	
Less than high school	2
Completed high school only	17
More than high school	81
Partner employment status (%)	
Partner employed	86
Partner unemployed	3
Not partnered	11
Maternal Health (%)	
Good	90
Fair	10
Child Health (%)	
Good	86
Fair	14

TABLE 3.2: Comparison of depressive symptoms, workplace attributes and modifying factors over time

	Time				
	Baseline (month 1)	*6 months*	*15 months*	*24 months*	*Average*
Maternal Depression (mean, SD)	10.0, 8.4	7.8, 7.0	8.1, 7.4	8.6, 7.5	8.2, 7.3
Hours worked per week (mean, SD)		33.9, 13.17	35.07, 12.86	34.81, 12.36	34.6, 12.8
Work schedule (%)	-				
Day shift		80	80	80	80
Not day shift		11	10	9	10
Variable		9	10	11	10
Schedule Flexibility (%)	-				
Very flexible		26	21	22	23
Fairly flexible		39	44	40	41
Minimally flexible		31	32	35	33
Not flexible		4	3	3	3
Work from home (%)	-				
No		75	77	79	77
Yes		25	23	21	23
Job Concerns (mean, SD)	-	-	-1.15, 0.88	-1.07, 0.91	-1.11, 0.90
Social Support (mean, SD)	5.2, 0.60	5.0, 0.66	5.0, 0.67	4.9, 0.71	5.0, 0.68
Family Income-to-Needs Ratio (mean, SD)	3.1, 2.6	4.5, 3.2	4.5, 3.3	3.2, 3.0	4.5, 3.1
Partnership Status (%)					
Partnered	92	92	90	89	90
Not partnered	8	8	10	11	10

TABLE 3.3: Pairwise correlations between outcome and primary predictor variables

	Maternal depression 6	Maternal depression 15	Maternal depression 24	Work Schedule 6	Work Schedule 15	Work Schedule 24	Flexibility 6	Flexibility 15	Flexibility 24	Work from home 6	Work from home 15	Work from home 24	Work intensity 6	Work intensity 15	Work intensity 24	Job concerns 15	Job concerns 24
Maternal depression 6	1																
Maternal depression 15	0.55	1															
Maternal depression 24	0.53	0.5	1														
Work Schedule 6	0.05	0.06	0.01	1													
Work Schedule 15	-0.003	0.07	0.01	0.53	1												
Work Schedule 24	0.005	-0..01	-0.01	0.44	0.55	1											
Flexibility 6	0.06	0.06	-0.01	-0.12	-0.13	-0.13	1										
Flexibility 15	0.01	0.04	0.001	-0.1	-0.14	-0.16	0.55	1									
Flexibility 24	0.04	0.08	-0.01	-0.07	-0.13	-0.16	0.42	0.53	1								
Work from home 6	-0.04	0.04	0.01	0.14	0.16	0.1	-0.18	-0.19	-0.1	1							
Work from home 15	-0.04	-0.04	-0.04	0.13	0.14	0.18	-0.19	-0.23	-0.17	0.56	1						
Work from home 24	-0.03	0.01	0.01	0.13	0.14	0.23	-0.22	-0.21	-0.18	0.5	0.61	1					
Work intensity 6	0.11	0.05	0.09	-0.19	-0.24	-0.14	0.21	0.17	0.11	-0.07	-0.1	-0.1	1				
Work intensity 15	0.11	0.01	0.13	-0.21	-0.29	-0.16	0.23	0.26	0.19	-0.13	-0.07	-0.05	0.73	1			
Work intensity 24	0.08	-0.01	0.08	-0.14	-0.26	-0.22	0.18	0.2	0.28	-0.04	-0.08	-0.06	0.067	0.74	1		
Job concerns 15	0.28	0.33	0.28	0.001	0.002	-0.03	0.17	0.18	0.11	-0.07	-0.06	-0.09	0.04	0.04	0.03	1	
Job concerns 24	0.24	0.025	0.35	-0.004	0.01	0.01	0.12	0.09	0.06	-0.06	-0.04	-0.04	0.05	0.06	0.06	0.68	1

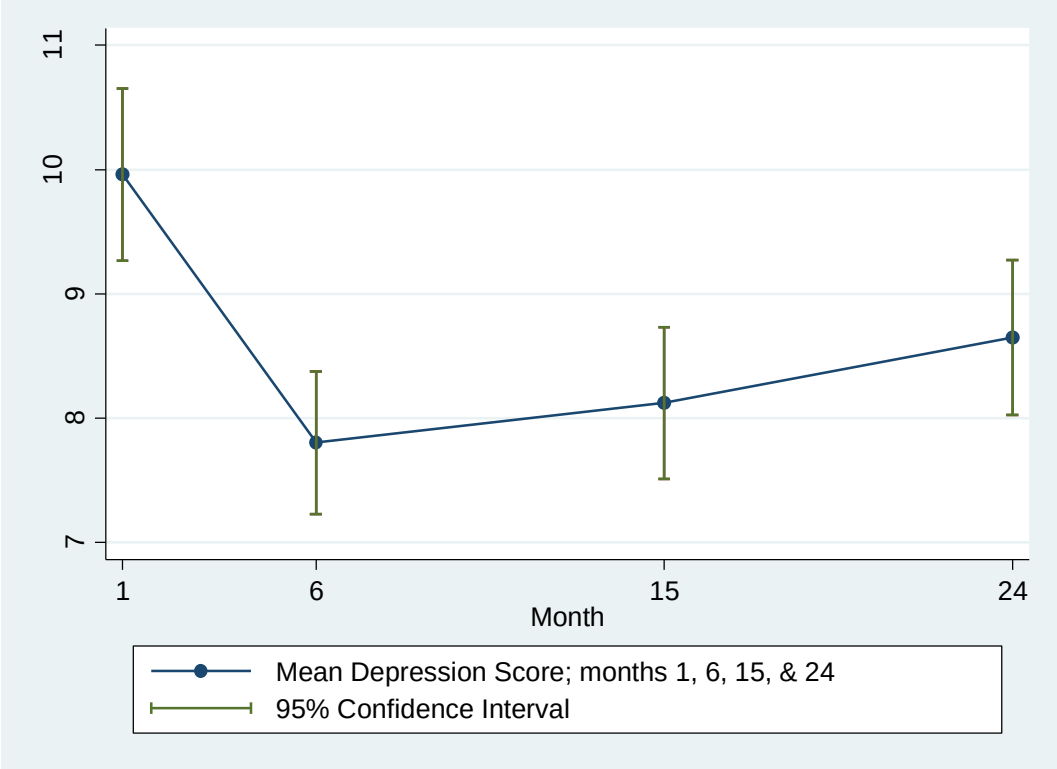
TABLE 3.4: Changes in depression score for a one-unit change in predictor variables, adjusted analyses

	Fixed Effects
	Change in depression score, β (SE)
Primary Predictors (within individual effects)	
Hours worked per week	
Low part-time 1-19 hours (Ref)	-
High part-time 20-34 hours	-0.71 (0.60)
Low full-time 35-49 hours	-0.50 (0.66)
High full-time 50+ hours	-0.56 (0.91)
Work schedule	
Day shift (Ref)	-
Not day shift	1.10 (0.70)
Variable	-0.45 (0.72)
Schedule Flexibility	
Very flexible	0.51 (1.01)
Fairly flexible	0.13 (0.95)
Minimally flexible	0.12 (0.92)
Not flexible (Ref)	-
Work from home (binary)	
Yes	-1.60* (0.53)
Number of hours work from home[a]	
Less than 1 day (1-8 hours)	-
1 to 2 days (9-16 hours)	0.57 (1.15)
2 to 3 days (17-24 hours)	-0.34 (0.16)
3 to 4 days (25 to 32 hours)	-2.91 (2.19)
more than 4 days (+32 hours)	0.80 (1.95)

Job Concerns	1.91** (0.43)
Primary Predictors (between individual effects)	
Hours worked per week	
Low part-time 1-19 hours (Ref)	-
High part-time 20-34 hours	0.99 (0.98)
Low full-time 35-49 hours	1.08 (0.94)
High full-time 50+ hours	1.00 (1.38)
Work Schedule	
Day shift (Ref)	-
Not day shift	-0.48 (1.09)
Variable	-0.32 (1.07)
Schedule Flexibility	
Very flexible	-1.89 (1.90)
Fairly flexible	-2.11 (1.82)
Minimally flexible	-1.87 (1.87)
Not flexible (Ref)	-
Work from home (binary)	
Yes	2.22* (0.81)
Number of hours work from home[a]	
Less than 1 day (1-8 hours)	-
1 to 2 days (9-16 hours)	0.54 (1.81)
2 to 3 days (17-24 hours)	4.93 (3.02)
3 to 4 days (25 to 32 hours)	2.46 (3.38)
more than 4 days (+32 hours)	-0.18 (2.87)
Job Concerns	-0.33 (0.51)

[a] *indicates sample only includes women who worked from home (n=132)*
**indicates statistical significance at p<0.05 & > 0.001 ** indicates statistical significant at p<0.001*

Figure 3.1. Growth Curve of Mean Maternal Depression Between Months 1 and 24 Post-Birth



Chapter 4

EARLY FAMILY FACTORS INFLUENCE ADOLESCENT HEALTH AND BEHAVIORAL OUTCOMES

Abstract

Introduction: We apply the developmental origins of health hypothesis to understand the effect of cumulative maternal income, a component fo the early child environment, on adolescent health and development. Maternal employment has been associated with child health and behavioral outcomes, but there is virtually no research about the relationship between maternal income and these outcomes in the US. This study exmines whether cumulative maternal income from birth to 3rd grade is related to weight and health status and behavioral outcomes at age 15. Further, we examine the effect of cognitive and non-cognitive attributions on these outcomes.

Methods: Using data from the NICHD Study of Early Child Care and Youth Development, a longitudinal study which followed a cohort of families from their child's birth in 1991 until 2005, we apply an endogenous treatment effect model within a structural equation modeling framework to study these relationships.

Results: We find that cumulative maternal income and cognitive and non-cognitive attributes are not related to adolescent health and behavioral outcomes. However, components of the early family environment were related to specific outcomes. Lower family socioeconomic status, higher maternal work intensity, and high birth weight were related to adolescent overweight and obesity. Higher levels of health endowment were predictive of better health status, fewer behavioral problems, and no tobacco use. Parental marital status and non-minority race/ethnicity were also protective against negative outcomes.

Conclusions: Our findings show that the effects of the early family environment emerge as early as in adolescence and provide additional evidence about the need for policy and program interventions that target vulnerable families with small children to rectify potential health disparities observed in later life.

Introduction

Maternal employment may be associated with a range of child and adolescent outcomes, including weight status, health status, and behavioral and cognitive outcomes.[1–8] The underlying hypotheses are that 1) working mothers have less time and flexibility to ensure that their children's health and behavioral needs are appropriately met and to provide adequate supervision, and 2) employment-related parental stress may negatively influence children.[6–9] However, the evidence is mixed and much of the research in this area is dated. Maternal income, an important benefit of maternal employment, has not been examined as a predictor of child health in developed contexts. While evidence suggests that family income may be associated with general child health,[10] there is minimal knowledge about the independent effects of maternal income, when controlling for family income, on child health. Understanding this issue may offer a new perspective on how maternal employment can shape the early family environment, reduce the inter-generational transmission of poverty, and positively contribute to child health.

In developing countries increasing a mother's contribution to family income has been linked with improved child health, but this link has not been explicitly studied in the US.[11] This association is likely a function of decisions regarding intra-household resource allocation.[12] Studies show that among married couples, women who earn higher incomes have a greater share of household expenditure.[13] In addition, as a woman's contribution to family income increases (both absolutely and relative to their spouse/partner) households are more likely to make investments in their children for food,[14] childcare,[15] and other goods[16,17] that positively contribute to health and behavioral outcomes.[18]

The first mechanism linking maternal income and child health is rooted in a mother's participation in household purchasing decisions and the consequent observed investments she makes in herself and her children. This hypothesis is consistent with the *fundamental causes perspective* which suggests that positive health benefits are conferred upon those who can afford them.[19] In this case, women who earn more or have more control over money may choose to purchase healthier foods,[14] healthcare,[20] higher

quality child care, and access to settings that promote physical activity for their children. Investment in nutrition and physical activity improves child health and weight status and also gives parents the opportunity to model behaviors which positively impacts a child's cognitive and mental skills[21] and eating behaviors.[22]

Second, a woman's income level may also influence the investments she makes while pregnant which can affect the health of her unborn child.[20] For example, early initiation of antenatal care and not smoking has consistently been shown to increase birth weight[23,24] which is associated with positive health and weight status throughout life.[25,26] Childhood physical health and weight are in turn are predictive of adult health status, smoking and obesity.[27,28] This situation is an example of how health disparities might be transmitted across generations and may provide insight about appropriate contexts and points in the life cycle to target policy interventions.

Third, maternal characteristics captured by a mother's earning power in the household that are distinct from socioeconomic status may result in advantageous investments in children. The developmental origins of health hypothesis posits that parental characteristics, such as education and income, lead to unobserved investments in their children that affect that child's cognitive and non-cognitive capabilities and physical health.[29] Cognitive and non-cognitive capabilities are defined as attributes such as self-regulation, motivation, time preferences, etc.[29] For example, studies have shown that parental (mother and father) time investments, earnings, and non-cognitive skills are important for the development of a child's cognitive and non-cognitive abilities.[21,30–32] Non-cognitive skills in early childhood are important predictors of health status later in life.[27,29,33,34] Characteristics such as self-regulation,[35–37] delaying gratification,[38] and impulsivity,[39,40] may lead to negative health behaviors such as overeating, substance abuse, and risk-taking.[39–41]

Examining the independent effects of maternal income on child health is important for several reasons. The majority of existing research has focused on family characteristics, such as family income, education,

and insurance status.[32] Maternal income is a potentially critical, though unexplored determinant of child health in the US. Adolescence is a critical period for the onset of health and behavioral issues; life-long patterns of health behavior are established during this period[42] and policy-level interventions to promote healthy living may be most effective and feasible during this stage in the life-course.[43]

Childhood and adolescence are critical periods for determining health status in later life.[33,44] Moreover, early family environments predict ethnic/racial health disparities in adulthood.[26] Therefore, strengthening the evidence about how early life factors, such as maternal income, are associated with health during childhood is important. This knowledge will contribute to the design of policy interventions that target early life critical periods in order to mitigate socioeconomic disparities in adult weight status. If higher maternal income protects child health, policies focusing on conditional cash transfers to low-income mothers[32] and the gender-income gap may have long-term implications. Programs in low-wage, female-dominated industries that target financial decision-making and increase knowledge about child development, parenting skills, nutrition, and physical activity may benefit the family unit. Government and workplace policies that allow women in these settings to save greater amounts of pre-tax earnings for their children's health care and support flexible work schedules so that women can pursue advanced degrees and increase their earning power may also address this issue.

Finally, previous research has focused on how maternal employment attributes negatively influence child health and development.[1–5] However, this perspective fails to offer viable solutions for how employed women can work and protect their children against poor outcomes. Examining maternal income as a predictor of adolescent outcomes assumes that the working mother actively makes decisions regarding her income that improves the health and well-being of her children and thus views her participation in the labor force as a positive contribution to her industry, society, and family. This study is framed in the context of the developmental origins of health hypothesis to understand if cumulative maternal income, an attribute of the early family environment, is associated with adolescent health and development. The

early family environment is defined as parental and family characteristics from pre-birth to grade 3. We hypothesize that 1) maternal income in childhood predict adolescent outcomes at age 15, including weight and health status, depression, problem behaviors, risk-taking, psycho-social maturity, and smoking and 2) cognitive and non-cognitive capabilities in 3rd grade predict adolescent outcomes at age 15.

Methods

Data Source and Sample: The NICHD Study of Early Child Care and Youth Development (SECCYD) is a national longitudinal study originally designed to explore the effects of non-maternal child care on child outcomes. The study recruited 1,364 children born in 1990 at 10 sites across the United States and followed them from month one to 15 years of age.[45] The sample catchment area consisted of 6,189 children. Participant retention rates were 1,100 in 3rd grade (Phase 3) and 1,056 at age 15 (Phase 4). Our analyses comprise all children in the NICHD SECCYD database between 1991 and 2005 who remained in the study through 3rd grade and whose mothers were employed during at least one time period between 6 months and 3rd grade (n=1.043). We chose 6 months post-birth as the cut-off for maternal employment to provide sufficient time for women to return to work after maternity leave. Families were considered to have dropped out of the study by 3rd grade if they did not complete a home interview during 2nd and 3rd grades. This study was determined to be exempt from IRB Review by the University of Washington Institutional Review Board.

Measures: The outcome variables are measured at age 15 and include an indicator of overweight/obese, health status, child depressive symptoms, risk-taking, behavior problems, psycho-social maturity, and never/ever smoked a cigarette.

- Overweight/obese is measured as "overweight/obese" (1) and "not overweight" (0). Research shows that ages five to seven and adolescence are critical periods for childhood weight gain; therefore this approach has practical applications.[46] BMI measurements were recorded each year beginning at 54 months by project staff during laboratory visits. BMI was calculated by weight (kg)/height^2 (m^2) and converted into an age and sex specific percentile using CDC growth chart

alogrithms.[47] The indicator variable was developed using 85% (adjusted for age and sex) as the cut-off for overweight/obese.

- Health status (mother reported) was measured on a 4-point scale (excellent to poor) and was rescaled so that higher scores indicated lower levels of poor health to standardize the interpretation of coefficients across all outcomes. This variable was dichotomized for this analysis as "fair/poor" (1) and "excellent/good" (0).
- Child depressive symptoms was measured using the Children's Depression Inventory (CDI),[48] a 10-item scale asking adolescents to describe how they felt in the past 2 weeks. Higher scores represent a greater number of reported depressive symptoms. Internal reliability was 0.81. This variable was dichotomized at the sample median and is represented as the score "above the median" (1) and "below the median" (0).
- Risk-taking was measured using adolescent report of risk-taking behaviors. This was a 61-item instrument with a 3-point Likert scale that was developed for the NICHD SECCYD. It assessed the frequency of engagement in specific behaviors, including substance abuse, sexual behaviors, safety behaviors (helmet and seat belt use), aggression, and delinquency. Internal reliability was α=0.89. For this analysis, this variable was dichotomized at the sample median and is represented as "above the median of risk-taking behaviors" (1) and "below the median" (0).
- Behavior problems were measured using 40 items (0-2 Likert scale) from the Social Skills Rating System[49] that were related to behaviors that influence social competency and adaptive functioning. Internal reliability was 0.86. For this analysis, this variable was dichotomized at the sample median and is represented as "above the median number of problem behaviors" (1) and "below the median" (0).
- Psychosocial maturity was measured using the Psychosocial Maturity Inventory,[50] a 30-item scale with a 4-point scale developed by Greenberger which measures adolescent capacity for responsible self-management. Internal reliability was 0.87. This variable was rescaled such that

higher scores represented lower levels of psychosocial maturity to aid coefficient interpretation across outcomes and dichotomized at the sample median and is represented as "above the median"-low psychosocial maturity (1) and "below the median" (0).

- As part of the risk-taking survey, respondents were asked to report the number of cigarettes they smoked in their lifetime. This information was recorded on an ordinal scale from 0-4. Twenty percent of respondents reported having smoked at least one cigarette in their life-time. Therefore, this variable was dichotomized into "ever smoked" (1) and "never smoked" (0) for this analysis.

Cumulative maternal income is the primary predictor of adolescent health outcomes; it is defined as annual maternal income aggregated between 6 months post-birth and 3rd grade. Cumulative maternal income was highly kurtotic and skewed; therefore, a binary variable corresponding to the median value was used for all analyses—"below median income" (0) and "median income or above" (1). Income data was collected at months 6, 15, 24, 36, 54, kindergarten, 1st grade, and 3rd grade. Missing observations of maternal income were imputed using the average of individual annual income between months 6 and 3rd grade. Studies show that chronic economic deprivation may be more influential on child health than deprivation at one point in time;[51] we extend this theory to the study of maternal income and health. This study considers absolute cumulative maternal income, controlling for family socioeconomic status (which includes several measures of family income), as opposed to the mother's percent contribution to cumulative family income. The literature shows that both measures result in increased spending on children.[15,16]

Latent factor scores corresponding to cognitive and non-cognitive capabilities at 3rd grade are included in some models as they may be important mediators of the relationship between cumulative maternal income and adolescent outcomes. Each latent factor is comprised of four distinct measures all with high internal reliability scores (α=0.79-0.96). The non-cognitive capabilities latent factor is measured by maternal reported indicators of child social skills, peer competency, self-control and hyperactivity/impulsivity. All scales are continuous and higher scores represent higher levels of the positive trait (i.e. high scores

represent lower levels of hyperactivity and impulsivity and higher levels of self-control). The hyperactivity/impulsivity score was rescaled by multiplying the original scale by -1.0 and adding a constant so that the revised range was 0 to 26 with 26 representing the lowest levels of reported hyperactive/impulsive behavior. Hyperactivity/impulsivity was measured using the Diagnostic and Statistical Manual of Mental Disorders (4th Edition).[52] The social skills and self-control measures were derived from the Social Skills Rating Form.[49] Peer competency assessed a child's ability to interact with peers, including joining group activities, responding appropriately to peers, controlling his/her temper, giving compliments, and displaying self-confidence in social situations.

The cognitive capabilities latent factor is comprised of the mother's perception of the child's academic ability and three teacher-reported measures, including overall academic competence, current school ability, and total academic skills compared with other children at the same grade level. All measures are continuous and higher scores represent higher levels of the desirable trait. Academic skills and current school ability were derived from items on the Child Evaluation Questionnaire which was used in the Early Childhood Study of the National Center for Educational Statistics.[53] Academic competence was estimated by summing items from the Social Skills Rating System form.[49] School ability was defined by a questionnaire developed for the NICHD SECCYD assessing maternal perceptions of the child's ability in science, math, reading and spelling.

The early family environment and health endowment exert an important influence on health in later childhood and adulthood.[26,27] Factors representing critical components of the early childhood environment and health endowment are included to account for these effects. Two factors emerged from a principle components analysis (PCA) of multiple early childhood environmental characteristics that are associated with child health and development, including average hours worked per week (by mother between months 6 and grade 3), average number of periods of reported employment (by mother between months 6 and grade 3), logged cumulative family income, logged average income-to needs ratio, and logged family income during pregnancy.[5,54] These factors explained 90% of the variability. Missing

values of employment status and income-to-needs ratio were imputed using individual-level means. The two factors are identified: "family socioeconomic status" with higher values indicating higher levels of income and lower levels of poverty; and mother's "employment characteristics" with higher values indicating more time spent working.

Several early childhood environment variables did not load well onto the factors and were included as separate covariates in the models--mother race/ethnicity (White (1)/not White (0), marital status (married (1) /not married (0) averaged between months 1 and grade 3), age at child's birth (categorical indicator variable 18-24, 25-29, 30-35, and 35+ years), and education (categorical indicator variable "less than HS", "completed HS", and completed more than HS").

Health endowment, defined as parental health attributes, was defined from a principle component analysis of maternal and paternal health status averaged at months 1, 6, 15, 24, and 36 post-birth and maternal depressive symptom score averaged from months 1, 6, 15, 24, 36, and grades 1 and 3. Maternal and paternal health status was measured on a 4-point scale (poor to excellent). Maternal depressive symptoms were assessed using the CES-D and was rescaled such as that higher scores indicated lower levels of depression. One component explaining 60% of the variability of these factors was identified; higher scores indicate higher levels of positive health endowment. Birth-weight did not load well into the factors and was included as a separate covariate in the model defined as low birth-weight (<2500 grams), normal birth-weight (2500-4000grams) and high birth-weight (>4,000 grams).

Statistical analyses:

This research question is limited by several threats to causal inference. First of all, it is likely that unobserved heterogeneity is present. For example, a mother's decision to work and choice of occupation and work intensity as well as child health and behavioral outcomes may be related to factors, such as maternal personality and parenting practices, not captured in this dataset. Without accounting for unobserved heterogeneity it is likely that the treatment estimates would be inflated due to the incremental

effects that are not accounted for over time. This analysis addressed threats to causal inference by using an endogenous treatment effects models with a structural equation modeling (SEM) framework. Endogenous treatment effects models relax the assumption of conditional independence (i.e. the predictor and outcome must be independent of one another) by selecting on unobservables that are presumed to be correlated with treatment and outcome variables. SEM allows the analyst to account for this correlation by introducing a latent variable that is identified by both the predictor and numerous outcome variables and modeling the individual outcome equations simultaneously. In this analysis, the latent factor was identified by maternal cumulative income and the 7 adolescent health and behavioral outcomes. The models were identified as described below and modeled simultaneously:

- Model 1: $Y_{\text{maternal income cumulative}}=g(\alpha_0 + \alpha_{1\text{latent factor}}[@1] + X_{4\text{observed}}+ \Theta_{1\text{geneticehealthendow}} + \Theta_{2\text{familyfactors}} +\varepsilon)$
- Model 2: $Y_{\text{overweight15}}= g(\alpha_0 + \alpha_{1\text{latent factor}} +\alpha_{2\text{cognitive factor}}+ \alpha_{3\text{noncognitivefactor}}+ X_{1\text{matincome}}+ X_{2\text{observed}}+ \Theta_{1\text{geneticehealthendow}} + \Theta_{2\text{familyfactors}} +\varepsilon)$
- Model 3: $Y_{\text{healthstatus15}}= g(\alpha_0 + \alpha_{1\text{latent factor}} +\alpha_{2\text{cognitive factor}}+ \alpha_{3\text{noncognitivefactor}}+ X_{1\text{matincome}}+ X_{2\text{observed}}+ \Theta_{1\text{geneticehealthendow}} + \Theta_{2\text{familyfactors}} +\varepsilon)$
- Model 4: $Y_{\text{depressionbin15}}= g(\alpha_0 + \alpha_{1\text{latent factor}} +\alpha_{2\text{cognitive factor}}+ \alpha_{3\text{noncognitivefactor}}+ X_{1\text{matincome}}+ X_{2\text{observed}}+ \Theta_{1\text{geneticehealthendow}} + \Theta_{2\text{familyfactors}} +\varepsilon)$
- Model 5: $Y_{\text{risktaking15}}= g(\alpha_0 + \alpha_{1\text{latent factor}} +\alpha_{2\text{cognitive factor}}+ \alpha_{3\text{noncognitivefactor}}+ X_{1\text{matincome}}+ X_{2\text{observed}}+ \Theta_{1\text{geneticehealthendow}} + \Theta_{2\text{familyfactors}} +\varepsilon)$
- Model 6: $Y_{\text{problembehavior15}}= g(\alpha_0 + \alpha_{1\text{latent factor}} +\alpha_{2\text{cognitive factor}}+ \alpha_{3\text{noncognitivefactor}}+ X_{1\text{matincome}}+ X_{2\text{observed}}+ \Theta_{1\text{geneticehealthendow}} + \Theta_{2\text{familyfactors}} +\varepsilon)$
- Model 7: $Y_{\text{psychosocial maturity15}}= g(\alpha_0 + \alpha_{1\text{latent factor}} +\alpha_{2\text{cognitive factor}}+ \alpha_{3\text{noncognitivefactor}}+ X_{1\text{matincome}}+ X_{2\text{observed}}+ \Theta_{1\text{geneticehealthendow}} + \Theta_{2\text{familyfactors}} +\varepsilon)$
- Model 8: $Y_{\text{eversmokedtobacco15}}= g(\alpha_0 + \alpha_{1\text{latent factor}} +\alpha_{2\text{cognitive factor}}+ \alpha_{3\text{noncognitivefactor}}+ X_{1\text{matincome}}+ X_{2\text{observed}}+ \Theta_{1\text{geneticehealthendow}} + \Theta_{2\text{familyfactors}} +\varepsilon)$

Descriptive analyses were performed; proportions/means and standard deviations were computed for all variables. Factor (i.e. family SES, health endowment, and cognitive capabilities) and observed (i.e. maternal marital status and birth weight) variables were examined for skew and kurtosis, and bivariate and multivariate distributions were examined for outliers and deviations from normality. Missing data patterns and potential mechanisms were also examined and sensitivity analyses were conducted to understand the potential impact of missing data on study results. Sample covariances were examined and variables with large variances were rescaled.

Principle components analysis was used to predict continuous factor scores for the early childhood environment and health endowment. Measurement models for the non-cognitive and cognitive capabilities and unobserved latent factors were examined for goodness of fit, strength of the correlations between indicators, and magnitude of the factor loadings. The path coefficient between the cognitive and non-cognitive factors and the indicator with the highest reliability measure was fixed to one. The non-cognitive factor was modeled with a correlated error between social skills and peer competency. The scores of the cognitive and non-cognitive factors were predicted and included in the model as scores and not as complete measurement models to improve model convergence. The path coefficient between the latent unobserved factor and maternal income was fixed to one.

Generalized structural equation linear probability models were used determine the predictive ability of binary maternal income on the binary adolescent outcomes controlling for all covariates. Risk differences and associated standard errors are presented; statistical significance is determined at $\alpha=0.05$

Maximum likelihood estimation with robust standard errors was used; generalized structural equation models account for missing data using equation-wise deletion and not a pair-wide deletion and can thus preserve more information. Goodness of fit was examined using the Pearson Correlation, Pregibon Link, Hosmer-Lemeshow tests, and visual inspections of the residuals. Analyses were performed using STATA IC 13 (College Station, TX).

Results

Descriptive Statistics and Variable Distributions: Descriptive statistics, including sample proportions/means and standard deviations, are reported in Table 1. Examination of univariate and multivariate distributions demonstrated fairly linear distributions and homoscedastic errors across the majority of outcomes. Several outcome variables were highly skewed and kurtotic and several covariates, including health endowment and maternal employment characteristics, were not linearly related to the outcomes. These variables were included in the models as binary variables. Goodness-of-fit tests

revealed poor model fit for Models 4, 5, and 7. We attempted to improve model fit by including alternative covariate and outcome specifications, but these changes did not improve the results of the goodness-of-fit tests.

Missing Data: There were 1,364 families in the NICHD SECCYD study at baseline. Our sample (n=1,043) comprises 76% of the original sample. Thirteen percent (n=183) of women in the original sample reported not working at all during the first five years of the study child's life. These women were less likely to have worked during pregnancy (43% versus 91% of women who were employed during the first five years of the study child's life). Maternal employment during this period was associated with lower poverty and higher family income, lower levels of maternal depression, marital status, and race (White and Hispanic women were more likely to work). Nineteen percent (n=263) of the original sample had dropped out by 3rd grade. Attrition was associated with lower likelihood of being married, higher family income and lower poverty, older maternal age, and White race/ethnicity. The most frequently reported reasons for dropping out in Phase I (by 36 months) included geographical relocation, time constraints, and personal reasons. The sample for this analysis likely contains a lower proportion of minority, single parent, and higher income families than might be present in the study population catchment areas.

The sample for this analysis contained 7.5% missing data elements, but 40% of individuals were missing information for at least one variable. The missing observations were concentrated in the outcome variables at age 15. BMI at age 15 was missing the most information (missing 23%) and the other health and behavioral outcome variables were missing between 12-14%. The indicators for the cognitive and non-cognitive factors measured at 3rd grade were missing between 7.5-11.5%. Missing data was predicted by lower maternal education and age, fewer periods of maternal employment, and being married. Racial/ethnic minority families were more likely to have missing data. Missing data was not associated with maternal and family income or with income-to-needs ratios. Despite the high proportion of missing cases, the generalized structural equation modeling techniques in STATA do not exclude any case with

missing observations and so the analyses included information from 983 cases (94% of the full sample). In sensitivity analyses results did not differ between the structural models run with complete cases (n=683) versus the generalized model SEM estimation (n=983). Despite this, it is possible that the results presented contain some bias.

Correlations: Correlations among the indicator variables for each factor are reported in Table 2. The indicators of the cognitive capabilities factor were highly correlated (α=0.58 to 0.86). Hyperactive/impulsive behavior was the least highly correlated indicator among the non-cognitive capability indicator measures (α=0.42 to 0.85). Correlations among unobserved factor indicator variables were fairly low (absolute values: α=0.02 to 0.26) given the fact that the "unobserved" factor is difficult to define. The indicators were chosen to represent a fairly wide range of potential unobserved health and behavioral characteristics. The cognitive and non-cognitive factor-specific indicator correlations were higher than the correlations between indicators loading onto distinct factors.

Latent Factor Measurement Models: Table 3 shows the loadings of indicators on their respective factors and goodness of fit indices for each measurement model; all measures are statistically significant. The indicators of the cognitive and non-cognitive latent factors had high factor loadings. For the purposes of assessing goodness of fit of the measurement model, the unobserved latent factor was modeled independently of the other covariates using continuous scales for cumulative income and the outcome indicators (except for child health status); this model included a correlated error between risky behavior and tobacco use because the tobacco use indicator was taken from the risky behaviors instrument. The path coefficients between the indicators and the unobserved latent factor, especially maternal income, were not as strong. The goodness-of-fit tests demonstrate that all measurement models fit the covariance matrix well (X^2 $p>0.05$).

Structural Equation Models: The results from the structural equation model are shown in Table 4. The analysts found no inadmissible solutions to suggest that the model was unidentified. Unstandardized treatment effects (risk differences), standard errors and significance levels are displayed. The results

represent the absolute change in risk of the outcome that is attributable to the predictors. All of the predictors are scaled such as 1 indicates a higher level of an undesirable outcome (i.e. 1=overweight/obese vs. 0=normal weight).

We find that some factors of the early childhood environment are associated with adolescent health and behavioral outcomes. Our primary predictor of interest, maternal income, was not associated with any outcome when controlling for family socioeconomic status and other components of the early childhood environment. However, one unit increase in family socioeconomic status was associated with a 0.05 point decrease in the probability of being overweight or obese at age 15. Maternal employment characteristics (defined by higher work intensity over time) and high birth weight (>4,000 grams) were also associated with a 0.09 and 0.10 point increase in the probability of being overweight or obese at age 15, respectively. Higher levels of health endowment were predictive of improved adolescent outcomes at age 15, including better health status, fewer behavioral problems, and no tobacco use. Parental marital status (being married) was also protective against adolescent risk-taking and tobacco use. Finally, White race predicted a 0.13 point decrease in the probability of risk-taking. Maternal age, education level, and cognitive and non-cognitive capabilities were not predictive of adolescent outcomes when controlling for other covariates.

We also ran the models without the cognitive and non-cognitive factors scores; the differences in the point estimates and standard errors were negligible and so the results from these models are not presented in the tables.

Discussion

We examined the influence of maternal income and other components of the early family environment on adolescent health and behavioral outcomes. Our findings indicate that some aspects of the family environment between birth and 3rd grade may have a persistent effect on outcomes as early as in adolescence. Maternal income did not appear to influence these outcomes. However, family

socioeconomic status, birth weight, health endowment, maternal marital status, and maternal employment attributes were related to some outcomes.

Our results confirm previous findings suggesting that specific aspects of the early family environment influence later health and behavioral outcomes, including birthweight,[26] family income and socioeconomic status,[26] parental health,[26,32] and maternal employment.[1] Health endowment, including parental health status and maternal depression, may be an important proxy for family-level health and care seeking behaviors and parent-child interactions that affect the well-being of the child over time. Family socioeconomic status and maternal employment may be related to time and monetary investments that families make in their children which may be critical for promoting enriching environments and healthy lifestyles.

Our results do not support the hypothesis that cumulative maternal income is an independent predictor of adolescent health and behavioral outcomes. Studies from developing contexts have shown that programs, such as micro-credit and cash-transfers to mothers, improve the health outcomes of their children.[12] The health and developmental needs of children in the United States are very different. First of all, the baseline health status of US children is higher and the majority of children have medical insurance and reasonable access to vital clinical care, including immunizations. Therefore, US children may benefit more from different types of parental investments, including high quality nutrition, parental supervision, and enriching home and school environments, which may be a function of other characteristics of the family environment and not maternal income. Finally, it is possible that in the US household-level financial decision-making and control is not a function of what a woman earns, but is equitably shared and that child investments is a household, as opposed to an individual parent, decision.

A substantial body of literature shows the effect of cognitive and non-cognitive capabilities on adult educational, health and health behavior outcomes.[34,44,55] However, our findings do not demonstrate a similar effect. Cognitive and non-cognitive capabilities, measured at 3rd grade, were not related to any of

the outcomes at age 15. Research shows that these capabilities are malleable through late-childhood and that non-cognitive capabilities do not become fixed until adolecense.[44] Therefore, perhaps these capabilities are still "under development" at age 8 and do not exert a stable, observable effect on outcomes until adulthood.

This study extends existing research by considering a range of specific health and behavioral outcomes and by broadening the concept of the early family environment to include factors not generally considered in related studies, such as maternal employment. Extant research has tended to focus on adult outcomes; fewer studies have examined outcomes during adolescence leaving a gap in the evidence-base regarding when the effects of the early family environment emerge. Studies about this topic can suffer from methodological challenges due to long lag times between the predictor and outcomes of interest. In addition, there is not an abundance of longitudinal datasets with sufficiently large sample sizes.[32] We address some of these limitations by using a relatively large, very rich, longitudinal data source that provides a unique and compelling opportunity to study the effect of the early family environment. Our study traverses disciplines by combining a causal framework and the life-course perspective to examine numerous health and behavioral outcomes in adolescence.

We must also consider several limitations. The NICHD SECCYD is not nationally representative and therefore the results are not generalizable to the US population. Despite efforts to account for unobserved heterogeneity, it is possible that the latent variable did not capture all residual confounding. Also, adolescent outcomes and the early family environment, such as income, may have a dynamic effect on one another. For instance, it is possible that poor health during early childhood influenced parental income and also child outcomes at age 15. The design of our study does not account for the effect of potential early life shocks, except through the inclusion of birth weight, because these factors may also be strong mediators of the relationships examined. Finally, the goodness-of-fit tests revealed poor model fit for several of the outcomes, this may weaken some of our inferences.

The next steps are to improve the goodness-of-fit of the models and to test whether cognitive and non-cognitive capabilities modify the relationships examined.

The recognition of the importance of the social determinants of health and the early family environment on health outcomes across the life-course has increased substantially since the release of the World Health Organization's Commission on the Social Determinants of Health report in 2008. Our findings provide additional evidence about the need for family-level interventions for vulnerable families with small children to rectify potential health disparities observed in adolescence;[29] waiting to intervene until adolescence may not be optimal to achieve the greatest effect.[44] Policies and programs that offset the negative effects of low socioeconomic status, such as conditional cash-transfers to families with young children[32] and parenting courses for single mothers, and that reduce the burden on working mothers, such as affordable, high-quality childcare[9] and high-quality school nutrition programs, are necessary. As is evidenced by our results, the relationship between the early family environment and later health outcomes is complex and may rely on multiple mechanisms which make it difficult to identify key areas for intervention. More work is needed to identify conceptually which outcomes group together (i.e. smoking and health vs. smoking and risk-taking) and which early family environment factors might have important implications for groups of outcomes. With a more comprehensive understanding of these complex relationships, we will be better positioned to design and advocate for comprehensive programs and policies that support the well-being of US families across the life-course.

References

1. Anderson PM, Butcher KF, Levine PB. Maternal employment and overweight children. *J Health Econ*. 2003;22(3):477–504. doi:10.1016/S0167-6296(03)00022-5.

2. Buehler C, O'Brien M. Mothers' part-time employment: Associations with mother and family well-being. *J Fam Psychol*. 2011;25(6):895–906. doi:10.1037/a0025993.

3. Ruhm CJ. Maternal Employment and Adolescent Development. *Labour Econ*. 2008;15(5):958–983. doi:10.1016/j.labeco.2007.07.008.

4. Miller DP, Han W-J. Maternal nonstandard work schedules and adolescent overweight. *Am J Public Health*. 2008;98(8):1495–502. doi:10.2105/AJPH.2007.123885.

5. Morrissey TW, Dunifon RE, Kalil A. Maternal employment, work schedules, and children's body mass index. *Child Dev*. 2011;82(1):66–81. doi:10.1111/j.1467-8624.2010.01541.x.

6. Strazdins L, Obrien L V, Lucas N, Rodgers B. Combining work and family: rewards or risks for children's mental health? *Soc Sci Med*. 2013;87:99–107. doi:10.1016/j.socscimed.2013.03.030.

7. Montemayor R, Clayton MD. Maternal employment and adolescent development. *Theory Pract*. 1983;22(2):112–118. doi:10.1080/00405848309543048.

8. Jacobson KC, Crockett LJ. Parental Monitoring and Adolescent Adjustment: An Ecological Perspective. *J Res Adolesc*. 2000;10(1):65–97. doi:10.1207/SJRA1001_4.

9. Aizer A. Home Alone: Maternal Employment, Child Care and Adolescent Behavior. 2001. Available at: http://www.econ.ucla.edu/workingpapers/wp807.pdf.

10. Apouey B, Geoffard P-Y. Family income and child health in the UK. *J Health Econ*. 2013;32(4):715–27. doi:10.1016/j.jhealeco.2013.03.006.

11. Thomas D. Intra-Household Resource Allocation: An Inferential Approach. *J Hum Resour*. 1990;25(4):635. Available at: http://apps.webofknowledge.com.offcampus.lib.washington.edu/full_record.do?product=WOS&search_mode=GeneralSearch&qid=1&SID=3DfAJI8DNEcENGmD33m&page=1&doc=2. Accessed July 27, 2012.

12. Luis Rubalcava GTDT. Investments, Time Preferences, and Public Transfers Paid to Women. *Econ Dev Cult Chang*. 2009;(3):507–538.

13. Martin Browning, Francois Bourguignon, Pierre-Andre Chiappori VL. Income and outcomes: a structural model of intrahousehold allocation. *J Polit Econ*. 1994;(6):1067.

14. Kenney C. Father doesn't know best? Parents' control of money and children's food insecurity. *J Marriage Fam*. 2008;70(August):654–669. Available at: http://onlinelibrary.wiley.com/doi/10.1111/j.1741-3737.2008.00512.x/full. Accessed July 19, 2012.

15. Phipps SA, Burton PS. What's Mine is Yours? The Influence of Male and Female Incomes on Patterns of Household Expenditure. *Economica*. 1998;65(260):599–613. doi:10.1111/1468-0335.00148.

16. Attanasio O, Lechene V. Tests of income pooling in household decisions. *Rev Econ Dyn*. 2002;5(4):720–748. Available at: http://discovery.ucl.ac.uk/15171/.

17. Ward-Batts J. Out of the Wallet and into the Purse: Using Micro Data to Test Income Pooling. *J Hum Resour*. 2008;42(2):325–351. Available at: http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ792697. Accessed July 12, 2012.

18. Yeung W, Linver M. How money matters for young children's development: Parental investment and family processes. *Child Dev*. 2002;73(6):1861–1879. Available at: http://onlinelibrary.wiley.com/doi/10.1111/1467-8624.t01-1-00511/abstract. Accessed July 9, 2012.

19. Phelan JC, Link BG. Controlling disease and creating disparities: a fundamental cause perspective. *J Gerontol B Psychol Sci Soc Sci*. 2005;60 Spec No:27–33. Available at: http://www.ncbi.nlm.nih.gov/pubmed/16251587. Accessed July 8, 2013.

20. Barber SL, Gertler PJ. Empowering women: how Mexico's conditional cash transfer programme raised prenatal care quality and birth weight. *J Dev Eff*. 2010;2(1):51–73. doi:10.1080/19439341003592630.

21. Coneus K, Laucht M, Reuss K. The role of parental investments for cognitive and noncognitive skill formation--evidence for the first 11 years of life. *Econ Hum Biol*. 2012;10(2):189–209. doi:10.1016/j.ehb.2011.01.003.

22. Fisher JO, Mitchell DC, Smiciklas-Wright H, Birch LL. Parental influences on young girls' fruit and vegetable, micronutrient, and fat intakes. *J Am Diet Assoc*. 2002;102(1):58–64. Available at: http://www.sciencedirect.com.offcampus.lib.washington.edu/science/article/pii/S0002822302900179. Accessed July 19, 2012.

23. Pryor LE, Tremblay RE, Boivin M, et al. Developmental trajectories of body mass index in early childhood and their risk factors: an 8-year longitudinal study. *Arch Pediatr Adolesc Med*. 2011;165(10):906–12. doi:10.1001/archpediatrics.2011.153.

24. Utz RL, Reither EN, Waitzman N. Prenatal care, childhood obesity, and ethnic health disparities: analyses from a unique population database. *J Health Care Poor Underserved*. 2012;23(1):302–20. doi:10.1353/hpu.2012.0013.

25. Poston L. Influences of maternal nutritional status on vascular function in the offspring. *Curr Drug Targets*. 2007;8(8):914–22. Available at: http://www.ncbi.nlm.nih.gov/pubmed/17691928. Accessed July 30, 2012.

26. Johnson R, Schoeni R. The influence of early-life events on human capital, health status, and labor market outcomes over the life course. *J Econ Anal Policy*. 2011;11(2). Available at: http://escholarship.org/uc/item/71p310w1;via-ignore%3Drss. Accessed July 10, 2012.

27. Conti G, Heckman JJ. Understanding the Early Origins of the Education-Health Gradient: A Framework That Can Also Be Applied to Analyze Gene-Environment Interactions. *Perspect Psychol Sci*. 2010;5(5):585–605. doi:10.1177/1745691610383502.

28. McCarthy A, Hughes R, Tilling K, Davies D, Smith GD, Ben-Shlomo Y. Birth weight; postnatal, infant, and childhood growth; and obesity in young adulthood: evidence from the Barry Caerphilly Growth Study. *Am J Clin Nutr*. 2007;86(4):907–13. Available at: http://www.ncbi.nlm.nih.gov/pubmed/17921364. Accessed December 14, 2011.

29. Heckman JJ. The developmental origins of health. *Health Econ*. 2012;21(1):24–9. doi:10.1002/hec.1802.

30. Delaney L, Doyle O. Socioeconomic differences in early childhood time preferences. *J Econ Psychol*. 2012;33(1):237–247. doi:10.1016/j.joep.2011.08.010.

31. Bancroft K. The Trade-offs Parents Make: Examining the Relationship between Parental Employment, parental resources and childrens cognitive development. *Diss Abstr Sect A Humanit Soc Sci*. 2005;66(2):775. Available at: http://books.google.com/books/about/The_Trade_offs_Parents_Make.html?id=R44nGwAACAAJ. Accessed July 30, 2012.

32. Almond D, Currie J. Human Capital Development Before Age Five. 2010. Available at: http://www.nber.org/papers/w15827.pdf?new_window=1.

33. Cunha F, Heckman JJ. Formulating, Identifying and Estimating the Technology of Cognitive and Noncognitive Skill Formation. *J Hum Resour*. 2008;43(4):738–782. doi:10.3368/jhr.43.4.738.

34. Conti G, Heckman J, Urzua S. The Education-Health Gradient. *Am Econ Rev*. 2010;100(2):234–238. doi:10.1257/aer.100.2.234.

35. Francis LA, Susman EJ. Self-regulation and rapid weight gain in children from age 3 to 12 years. *Arch Pediatr Adolesc Med*. 2009;163(4):297–302. doi:10.1001/archpediatrics.2008.579.

36. Graziano PA, Calkins SD, Keane SP. Toddler self-regulation skills predict risk for pediatric obesity. *Int J Obes (Lond)*. 2010;34(4):633–41. doi:10.1038/ijo.2009.288.

37. Evans GW, Fuller-Rowell TE, Doan SN. Childhood cumulative risk and obesity: the mediating role of self-regulatory ability. *Pediatrics*. 2012;129(1):e68–73. doi:10.1542/peds.2010-3647.

38. Seeyave DM, Coleman S, Appugliese D, et al. Ability to delay gratification at age 4 years and risk of overweight at age 11 years. *Arch Pediatr Adolesc Med*. 2009;163(4):303–8. doi:10.1001/archpediatrics.2009.12.

39. Hartmann AS, Czaja J, Rief W, Hilbert A. Personality and psychopathology in children with and without loss of control over eating. *Compr Psychiatry*. 2010;51(6):572–8. doi:10.1016/j.comppsych.2010.03.001.

40. Van den Berg L, Pieterse K, Malik JA, et al. Association between impulsivity, reward responsiveness and body mass index in children. *Int J Obes (Lond)*. 2011;35(10):1301–7. doi:10.1038/ijo.2011.116.

41. Wood AP, Dawe S, Gullo MJ. The role of personality, family influences, and prosocial risk-taking behavior on substance use in early adolescence. *J Adolesc*. 2013;36(5):871–81. doi:10.1016/j.adolescence.2013.07.003.

42. Langer LM, Warheit GJ. The Pre-Adult Health Decision-Making Model: linking decision-making directedness/orientation to adolescent health-related attitudes and behaviors. *Adolescence*. 1992;27(108):919–48. Available at: http://www.ncbi.nlm.nih.gov/pubmed/1471570. Accessed November 5, 2012.

43. Calderon KS, Yucha CB, Schaffer SD. Obesity-related cardiovascular risk factors: intervention recommendations to decrease adolescent obesity. *J Pediatr Nurs*. 2005;20(1):3–14. doi:10.1016/j.pedn.2004.12.001.

44. Cunha F, Heckman J. The technology of skill formation. 2007. Available at: http://www.nber.org/papers/w12840.ack. Accessed July 10, 2012.

45. NICHD Early Child Care Research Network. Nonmaternal Care and Family Factors in Early Development: An overview of the NICHD Study of Early Child Care. *J Appl Dev Psychol*. 2001;22:457–492.

46. Dietz WH. Critical periods in childhood for the development of obesity. *Am J Clin Nutr*. 1994;59(5):955–9. Available at: http://www.ncbi.nlm.nih.gov/pubmed/8172099. Accessed November 5, 2012.

47. Centers for Disease Control and Prevention National Center for Health Statistics. CDC growth charts. 2000. Available at: http://www.cdc.gov/growthcharts/clinical_charts.htm#Summary.

48. Kovacs M. Children's Depression Inventory-Short Form. 1992.

49. Gresham F, Elliott S. The social skills rating system. 1990.

50. Greenberger E, Bond L. Technial manual for the Psychosocial Maturity Inventory. 1976.

51. Nikiema B, Gauvin L, Zunzunegui MV, Séguin L. Longitudinal patterns of poverty and health in early childhood: exploring the influence of concurrent, previous, and cumulative poverty on child health outcomes. *BMC Pediatr*. 2012;12(1):141. doi:10.1186/1471-2431-12-141.

52. Pelham W, Gnagny E, Greenslade D, Milich R. Teaching ratings of DSM-III-R symptoms for disruptive behavior disorders. *J Am Acad Child Adolesc Psychiatry*. 1992;31:201–218.

53. Nicholson, Atkins-Burnett, Meisels. Academic Rating Scale from the Early Childhood Longitudinal Study. 2001. Available at: http://nces.ed.gov/pubs2001/2001029_1_4.pdf.

54. Harrison K, Bost KK, McBride BA, et al. Toward a Developmental Conceptualization of Contributors to Overweight and Obesity in Childhood: The Six-Cs Model. *Child Dev Perspect*. 2011;5(1):50–58. doi:10.1111/j.1750-8606.2010.00150.x.

55. Carneiro P, Heckman J. Human Capital Policy. 2003. Available at: http://www.nber.org/papers/w9495.pdf?new_window=1.

TABLE 4.1: Participant characteristics

	Sample mean (SD)	Median	Range	Cronbach's Alpha
Maternal cumulative income (6 months post-birth to 3rd grade)	$149971.4 (144667.8)	$112,621.50	$0-$702,500	-
Non-cognitive Indicators (3rd grade)				
Social skills	106.13 (15.85)	108	51-130	0.90
Peer competency	15.87 (2.92)	16	2-20	0.79
Self-control	13.66 (3.40)	14	1-20	0.82
Hyperactivity/impulsivity	20.84 (4.58)	22	1-27	0.85
Cognitive Indicators (3rd grade)				
Child academic ability	3.40 (0.90)	3.5	1-5	0.96
Academic competence	99.13 (11.70)	100	62-115	0.96
Current school ability	4.18 (0.63)	4.25	1.75-5	0.70
Total academic skills	3.5 (0.84)	3.6	1-5	0.96
Outcomes (age 15)				
Overweight (% > 85th percentile)	31%	-	-	-
Health status (% excellent/good)	93%	-	-	-
Depressive symptoms (mean, SD)	2 (2.5)	1	0, 18	0.81
Risk-taking	6.1 (5.6)	4	0, 53	0.89
Behavioral problems	6.1 (3.5)	6	0, 20	0.80
Psychosocial maturity	0.67 (0.35)	0.63	0, 2.7	0.87
Tobacco use (ever smoked)	20	-	-	-
Early childhood environment components				
Cumulative family income (birth to 3rd grade)	$493,339 (353,250.8)	$409,250	$23,400-$1,532,507	-
Family income during pregnancy	$53,915.06 ($340,259.69)	$45,000	2500-272500	-
Average income to needs ratio (birth to 3rd grade)	3.66 (2.63)	3.02	0.23-17.81	-
Years of maternal education	14.41 (2.48)	14	7-21	-
Average hours worked per week (birth to 3rd grade)	24.99 (13.63)	25	0-63	-
Average number of periods of employment (birth to 3rd grade)	0.74 (0.28)	0.875	0.13-1	-
Race (%White)	83%	-	-	-
Mother age (years)	28.4 (5.6)	29	18-46	-
Health endowment components				
Avg maternal health status (birth through 36 months)	3.2 (0.51)	3.2	1,4	-
Avg paternal health status (birth through 36 months)	3.3 (0.54)	3.4	1,4	-

Ave maternal depression score as reported from CES-D (birth-3rd grade)	9.4 (6.18)	7.91	0, 38	-
Birth weight				
% Low birth weight (<2500 grams)	2.50%	-	-	-
% Normal birth weight (2500-4000 grams)	82.50%	-	-	-
% High birth weight (>4,000 grams)	15%	-	-	-

TABLE 4.2: Correlations	Non-Cognitive Indicators (3rd grade)				Cognitive Indicators (3rd grade)				Unobserved Indicators (age 15)							
	Social skills	Peer competency	Self-control	Hyperactivity /Impulsivity	Child academic ability	Academic competence	Current school ability	Total academic skills	Maternal cumulative income	Over-weight	Health status	Depressive symptoms	Risk-taking	Behavioral Problems	Psychosocial Maturity	Tobacco use
Non-cognitive Indicators																
Social skills	1.00															
Peer competency	0.85	1.00														
Self-control	0.82	0.50	1.00													
Hyperactivity/impulsivity	0.46	0.42	0.52	1.00												
Cognitive Indicators																
Child academic ability (perf)	0.30	0.27	0.28	0.25	1.00											
Academic competence (behav)	0.30	0.25	0.27	0.25	0.86	1.00										
Current school ability	0.25	0.21	0.22	0.21	0.67	0.64	1.00									
Total academic skills	0.26	0.22	0.24	0.21	0.78	0.76	0.58	1.00								
Outcomes/Indicators for unobserved latent factor																
Maternal cumulative income	0.11	0.16	0.12	0.08	0.18	0.13	0.10	0.13	1.00							
Weight status	-0.10	-0.12	-0.15	-0.13	-0.10	-0.10	-0.09	-0.07	-0.09	1.00						
Health status	0.06	-0.05	-0.07	-0.08	-0.04	-0.03	-0.08	-0.03	-0.02	0.06	1.00					
Depressive symptoms	-0.09	-0.09	-0.07	-0.05	0.05	0.01	-0.02	0.03	0.00	0.12	0.05	1.00				
Risk-taking	-0.14	-0.15	-0.17	-0.17	-0.21	-0.17	-0.15	-0.12	-0.10	0.09	0.09	0.15	1.00			
Behavior problems	-0.35	-0.34	-0.35	-0.32	-0.10	-0.13	-0.05	-0.10	-0.13	0.13	0.11	0.22	0.18	1.00		
Psychosocial maturity	-0.20	-0.18	-0.14	-0.13	-0.17	-0.17	-0.07	-0.13	-0.09	0.08	0.05	0.37	0.26	0.20	1.00	
Tobacco use	-0.11	-0.13	-0.15	-0.14	-0.14	-0.12	-0.11	-0.07	-0.10	0.07	0.05	0.16	0.49	0.19	0.18	1.00

TABLE 4.3: Latent factor measurement models

	Non-Cognitive Factor (3rd grade)	Cognitive Factor (3rd grade)	Unobserved Factor (age 15)
	Standardized β	Standardized β	Standardized β
Non-Cognitive Factor			
Social Skills*	0.85		
Self-Control	0.98		
Peer Competency	0.78		
Hyperactivity*	0.53		
Cognitive Factor			
Academic Behavior*		0.91	
Academic Performance		0.94	
Academic Skills		0.83	
School Ability*		0.69	
Unobserved			
Maternal income			0.17
Weight status*			-0.20
Health status			-0.16
Depressive symptoms*			-0.54
Risk-taking*			-0.42
Behavioral problems*			-0.42
Psychosocial maturity			-0.62
Tobacco use			-0.30
Goodness of Fit			
CFI	1.00	1.00	0.98
RMSEA (lower, upper)	0.00 (<0.001 0.05)	0.00 (<0.001, 0.04)	0.016 (<0.001, 0.03)
X^2, p-value	0.053, 0.082	0.38, 0.83	51.49, 0.13
df	1	2	41

**Variables have been rescaled so that higher scores indicate fewer problems*

TABLE 4.4: Endogenous treatment effect structural equation model results (risk differences, standard errors)[a]

Outcomes at age 15	Model 1 Maternal cumulative income (greater than 50%)	Model 2 Overweight (greater than 85th age for sex percentile)	Model 3 Fair/poor health status (vs. good/excellent)	Model 4 Depressive symptoms (greater than 50th percentile)	Model 5 Risk-taking score (greater than 50% percentile)	Model 6 Behavioral problems score (greater than 50th percentile)	Model 7 Psychosocial maturity (greater than 50th percentile)	Model 8 Ever smoked tobacco (vs. never)
Covariates								
Maternal cumulative income (birth to 3rd grade)	-	0.02 (0.05)	-0.02 (0.03)	-0.08 (0.13)	-0.09 (0.04)	-0.08 (0.08)	-0.10 (0.12)	-0.05 (0.06)
Family SES (birth to 3rd grade)	0.16** (0.008)	-0.05* (0.02)	0.007 (0.007)	0.02 (0.03)	-0.01 (0.02)	0.02 (0.02)	-0.01 (0.02)	0.001 (0.02)
Maternal employment characteristics (birth to 3rd grade) (>50%)	0.40** (0.02)	0.09* (0.04)	0.02 (0.02)	-0.004 (0.06)	0.04 (0.04)	0.001 (0.05)	0.02 (0.06)	0.07 (0.04)
Maternal race (White ref vs. Other)	-0.02 (-0.03)	-0.003 (0.05)	0.007 (0.03)	-0.04 (0.05)	-0.13* (0.05)	0.06 (0.05)	0.06 (0.05)	0.05 (0.04)
Average marital status (birth to 3rd grade)	-0.15* (0.04)	0.09 (0.06)	0.02 (0.03)	-0.03 (0.07)	-0.19* (0.06)	-0.10 (0.06)	-0.04 (0.06)	-0.18* (0.06)
Health endowment (birth to 3rd grade) (>50%)	0.0002 (0.02)	-0.06 (0.03)	-0.07** (0.02)	-0.05 (0.04)	0.04 (0.04)	-0.10* (0.04)	-0.02 (0.04)	-0.06* (0.03)
Birth weight								
Low (<2500 grams)	0.09 (0.05)	0.01 (0.10)	0.0001 (0.05)	-0.11 (0.10)	-0.01 (0.11)	-0.02 (0.10)	-0.13 (0.11)	0.003 (0.08)
Normal (2500-4000 grams)-Ref	-	-	-	-	-	-	-	-
High (>4000 grams)	0.05 (0.03)	0.10* (0.05)	0.04 (0.03)	-0.07 (0.05)	0.04 (0.05)	0.04 (0.05)	0.05 (0.05)	-0.02 (0.04)
Maternal age (birth)								
18-24 years (Ref)		-	-	-		-	-	-
25-29 years	0.07 (0.04)	-0.03 (0.06)	0.005 (0.03)	0.04 (0.05)	-0.001 (0.05)	-0.03 (0.05)	-0.06 0.05)	0.03 (0.04)
30-34 years	0.07 (0.04)	-0.10 (0.06)	-0.003 (0.03)	0.06 (0.06)	0.01 (0.06)	-0.06 (0.05)	0.07 (0.06)	0.003 (0.05)
35+ years	0.06 (0.05)	-0.16 (0.06)	0.01 (0.03)	0.05 (0.07)	-0.02 (0.06	-0.10 (0.06)	0.07 (0.06)	-0.05 (0.05)
Maternal education (birth)								
Less than high school (Ref)	-	-	-	-	-	-	-	-
Completed high school	-0.10 (0.05)	-011 (0.09)	-0.01 (0.05)	-0.08 (0.08)	0.10 (0.08)	0.05 (0.08)	0.03 (0.08)	0.04 (0.07)
Completed more than high school	-0.07 (0.05)	-0.07 (0.09)	-0.05 (0.07)	-0.11 (0.08)	0.03 (0.08)	0.11 (0.08)	-0.10 (0.08)	0.04 (0.07)
Latent Factor	1 (Constrained)	0.73 (0.51)	0.28 (0.24)	3.0 (1.84)	2.4 (1.80)	1.54 (0.98)	3.06 (2.1)	1.18 (0.79)

Cognitive factor score (measured at 3rd grade)	-	0.0008 (0.03)	-0.01 (0.02)	0.04 (0.03)	-0.01 (0.03)	0.01 (0.03)	0.02 (0.03)	-0.02 (0.02)
Non-cognitive factor score (measured at 3rd grade)	-	-0.23 (0.14)	-0.05 (0.07)	-0.21 (0.15)	-0.39 (0.15)	-1.04 (0.13)	-0.24 (0.15)	-0.31 (0.11)

**Indicates statistical significance at p<0.05, ** indicates statistical significance at p<0.001.*

[a] *All models were run simultaneously*

[b] *The psychosocial maturity score was rescaled so that higher values represent fewer indications of maturity*

Chapter 5 Conclusions

In this dissertation I examine several causal pathways between workplace attributes and maternal and child health outcomes. Chapter 2 examines the effect of maternal paid leave and work intensity on the use of pediatric preventive clinical services using instrumental variable techniques. Chapter 3 presents a fixed effects analysis of the effect of work schedule, work flexibility, work intensity, working from home, and job stress on depressive symptoms among employed women with very young children. Chapter 4 discusses the results from an endogenous treatment model to understand how cumulative maternal income during childhood affects adolescent health and developmental outcomes. The next section will summarize the results of Chapters 2, 3, and 4 and describe the contributions made to the field. The final section presents suggestions for future research and concluding remarks.

Summary

The relationship between workplace attributes and the use of preventive pediatric services. Fewer than half of all children in the United States aged 0 to 18 years receive recommended preventive health and dental services;[1–3] the underutilization of pediatric preventive care represents a missed opportunity for child health. Current research is limited, but evidence suggests that maternal employment attributes, including fewer hours worked and paid leave, may be associated with increased use of pediatric health services.[4–7] The analysis presented in Chapter 2 used recent data from the Medical Expenditure Panel Survey (MEPS) to examine the relationship between maternal work intensity and paid leave and the use of preventive pediatric care. The objective of this dissertation research was to build upon the current research to determine whether a causal relationship exists between workplace attributes and the use of preventive clinical services in order to support existing policy debates about work and family health.

The results described in Chapter 2 suggest that paid sick leave may influence compliance with several preventive care services for children, including well-child visits, dental care, and receipt of the influenza vaccine. Therefore, paid sick leave may be an important component of family-friendly workplace

policies by providing time flexibility that gives parents, particularly mothers, the opportunity to meet the preventive care needs of their children. Higher maternal work intensity may decrease the use of some preventive services suggesting that the benefits of paid leave may be time versus monetary flexibility. There was not a consistent moderating effect of maternal marital status, family income, or maternal education.

The relationship between workplace attributes and maternal depressive symptoms. In the United States a large proportion of employed women return to work soon after childbirth.[8–10] While maternal employment can have a beneficial impact on the mental health of women with young children,[11–14] these effects may depend on whether work-related attributes create stress and work/family conflict for women who transition back to work soon after birth.[10,15–18] Maternal depression can have serious negative consequences for young children;[19] therefore understanding the effect of specific maternal employment attributes is critical. Few studies have examined these relationships among mothers with young children; thus the analysis described in Chapter 3 contributes additional evidence and addresses gaps and limitations in the extant literature.

Our analysis demonstrates a causal effect of some work-related attributes on maternal depressive symptoms. Working from home appears to reduce the number of depressive symptoms suggesting that the ability to work from home may provide time flexibility that allows a woman to be with her children and fulfill family obligations, thereby reducing work/family conflict. Higher levels of job stress are related to an increase in depressive symptoms. This finding corroborates previous findings lending support to the hypothesis that high stress work environments may increase individual-level stress resulting in negative mental health outcomes for women with young children.[20–22] However, the results from this analysis do not demonstrate any moderating effects of the socioeconomic factors, including social support, family income-to-needs ratio, and partnership status on the relationship between maternal workplace attributes and depression. This finding indicates that broad-based policies, as opposed to policies that target

specific groups of disadvantaged mothers, may be more effective to address the negative effects of maternal workplace attributes on depressive symptoms.

The effect of cumulative maternal income in early childhood on adolescent health and developmental outcomes. Studies show that aspects of maternal employment, particularly long work hours, are associated with negative child outcomes, but minimal attention has focused on the positive contribution of maternal employment, such as maternal income, to family health. Maternal income has the potential to confer numerous benefits on children, including prenatal[23,24] and material investments in healthcare, food, and other goods.[25,26] Further, aspects of the early childhood environment, including family income, may contribute to unobserved investments in children's cognitive and non-cognitive development that are associated with healthy behaviors and educational attainment later in life which result in improved adult health status.[27–31] The analysis presented in Chapter 4 is one of the first to consider how maternal income in early childhood may independently affect adolescent health outcomes in the United States.

The results presented in Chapter 4 show that cumulative maternal income and cognitive and non-cognitive attributes are not related to adolescent health and developmental outcomes. However, other components of the early family environment were related to select outcomes. Lower family socioeconomic status, higher maternal work intensity, and high birth weight were related to adolescent overweight and obesity. Higher levels of health endowment were predictive of better health status, fewer behavioral problems, and no tobacco use. Parental marital status and non-minority race/ethnicity were also protective against negative outcomes. Our findings indicate that the importance of maternal financial decision-making and control may not operate in the same way in developed contexts or perhaps that other parental attributes are more important determinants of child health and development. Our results confirm what other studies have found about the importance of the early family environment on later health outcomes,[31,32] though we consider a broader range of outcomes and early family environment characteristics.

Conclusions and directions for future research

Working mothers can face tremendous challenges balancing work and family life and employment-related factors may have important implications for health. Workplace attributes have the potential to ease the burden of competing home and work demands by providing time and monetary flexibility and reducing stress. This dissertation research applies causal inference methods to understand the role of specific workplace attributes on some important family health outcomes. Our results indicate that workplace attributes, including paid leave, working from home, reduced job stress, and lower work intensity may be beneficial for family health. We find little evidence to support the hypothesis that socioeconomic disparities moderate these relationships suggesting that broad-based policy interventions may be more effective than policies which target vulnerable subgroups.

Our findings have important implications for policy development. Stronger organizational policies that provide sick leave and allow flex-time and working off-site may help families to balance work and family demands. National policies and programs that provide safe environments and encourage healthy behaviors and decision-making among children, including high-quality childcare and after-school programs, may also promote balance and support working parents to raise healthy, happy children.

However, more research is needed. There is not a clear definition about what constitutes an adequate package of family-friendly policies. Also, very little is known about effects of some maternal workplace attributes, such as childcare subsidies, on health. Finally, we do not yet have sufficient information about these relationships to develop a comprehensive model of the mechanisms linking workplace attributes and family health. Through research and political advocacy, the United States is making some strides to improve the lives of working parents and their children, but we still have a long way to go to achieve the status enjoyed by workers in comparable nations.[33]

I will contribute to these future directions by expanding on my dissertation research. For Aim 1, I will study the modification effects of the SES variables on all maternal employment attributes and will also

explore how sick and vacation leave may be differentially related to the receipt of pediatric preventive care through sensitivity analyses. Depending on the outcome of the peer review process at Social Science and Medicine, I will also conduct sensitivity analysis which considers changes in depression from 15-36 months using the 6-month depressive symptoms score as a baseline measure. I will add a lag depression variable to account for potential reverse causality and may consider the inclusion of other covariates, such as child care and the presence of the father in the home. For Aim 3, I will focus my manuscript on the effect of maternal income and plan to conduct another study to examine the effect of parental health endowment on adolescent health and development outcomes.

References

1. Schor EL. Rethinking Well-Child Care. *Pediatrics*. 2004;114(1):210–216. doi:10.1542/peds.114.1.210.

2. Edelstein BL, Chinn CH. Update on disparities in oral health and access to dental care for America's children. *Acad Pediatr*. 9(6):415–9. doi:10.1016/j.acap.2009.09.010.

3. Selden TM. Compliance with well-child visit recommendations: evidence from the Medical Expenditure Panel Survey, 2000-2002. *Pediatrics*. 2006;118(6):e1766–78. doi:10.1542/peds.2006-0286.

4. Colle A, Grossman M. Determinants of pediatric care utilization. *J Hum Resour*. 1978;XIII(Supp 1978):115–158.

5. Hamman MK. Making time for well-baby care: the role of maternal employment. *Matern Child Health J*. 2011;15(7):1029–36. doi:10.1007/s10995-010-0657-9.

6. Berger LM, Hill J, Waldfogel J. Maternity leave, early maternal employment and child health and development in the US*. *Econ J*. 2005;115(501):F29–F47. doi:10.1111/j.0013-0133.2005.00971.x.

7. Vistnes JP, Hamilton V. The time and monetary costs of outpatient care for children. *Am Econ Rev*. 1995;85(2):117–21. Available at: http://www.ncbi.nlm.nih.gov/pubmed/10160522. Accessed July 17, 2012.

8. Dye JL. Fertility of American Women. *Curr Popul Reports*. 2005;P20-555(December).

9. Shepherd-Banigan M, Bell J. Paid leave benefits of working mothers. *Matern Child Health J*. 2014;18(1):286–95.

10. Killien MG, Habermann B, Jarrett M. Influence of employment characteristics on postpartum mothers' health. *Women Health*. 2001;33(1-2):63–81. Available at: http://www.ncbi.nlm.nih.gov/pubmed/11523641. Accessed July 25, 2012.

11. Chen CH. Association of work status and mental well-being in new mothers. *Kaohsiung J Med Sci*. 2001;17(11):570–5. Available at: http://www.ncbi.nlm.nih.gov/pubmed/11852464. Accessed July 25, 2012.

12. Mayberry LJ, Horowitz JA, Declercq E. Depression symptom prevalence and demographic risk factors among U.S. women during the first 2 years postpartum. *J Obstet Gynecol Neonatal Nurs*. 2007;36(6):542–9. Available at: http://www.ncbi.nlm.nih.gov/pubmed/17973697. Accessed July 25, 2012.

13. Miyake Y, Tanaka K, Sasaki S, Hirota Y. Employment, income, and education and risk of postpartum depression: the Osaka Maternal and Child Health Study. *J Affect Disord*. 2011;130(1-2):133–7. Available at: http://www.ncbi.nlm.nih.gov/pubmed/21055825. Accessed July 25, 2012.

14. Stansfeld S, Candy B. Psychosocial work environment and mental health--a meta-analytic review. *Scand J Work Environ Health*. 2006;32(6):443–62. Available at: http://www.ncbi.nlm.nih.gov/pubmed/17173201. Accessed July 25, 2012.

15. Nichols MR, Roux GM. Maternal perspectives on postpartum return to the workplace. *J Obstet Gynecol Neonatal Nurs*. 33(4):463–71. Available at: http://www.ncbi.nlm.nih.gov/pubmed/15346672. Accessed June 19, 2012.

16. Strazdins L, Shipley M, Broom D. What does family-friendly really mean? Wellbeing, time and quality of parents' jobs. *Aust Bull Labor*. 2007. Available at: http://www.thefreelibrary.com/What does family-friendly really mean? Wellbeing, time, and the...-a0173643846.

17. Grice MM, Feda D, McGovern P, Alexander BH, McCaffrey D, Ukestad L. Giving birth and returning to work: the impact of work-family conflict on women's health after childbirth. *Ann Epidemiol*. 2007;17(10):791–8. Available at: http://www.ncbi.nlm.nih.gov/pubmed/17719242. Accessed July 25, 2012.

18. Grice MM, McGovern PM, Alexander BH, Ukestad L, Hellerstedt W. Balancing work and family after childbirth: a longitudinal analysis. *Womens Health Issues*. 2011;21(1):19–27. Available at: http://www.ncbi.nlm.nih.gov/pubmed/21185988. Accessed July 25, 2012.

19. Beck CT. Predictors of postpartum depression: an update. *Nurs Res*. 50(5):275–85. Available at: http://www.ncbi.nlm.nih.gov/pubmed/11570712. Accessed December 7, 2011.

20. Nieuwenhuijsen K, Bruinvels D, Frings-Dresen M. Psychosocial work environment and stress-related disorders, a systematic review. *Occup Med (Lond)*. 2010;60(4):277–86. doi:10.1093/occmed/kqq081.

21. Cooklin AR, Canterford L, Strazdins L, Nicholson JM. Employment conditions and maternal postpartum mental health: results from the Longitudinal Study of Australian Children. *Arch Womens Ment Health*. 2011;14(3):217–25. doi:10.1007/s00737-010-0196-9.

22. Dagher RK, McGovern PM, Alexander BH, Dowd BE, Ukestad LK, McCaffrey DJ. The psychosocial work environment and maternal postpartum depression. *Int J Behav Med*. 2009;16(4):339–46. Available at: http://www.ncbi.nlm.nih.gov/pubmed/19288209. Accessed July 25, 2012.

23. Pryor LE, Tremblay RE, Boivin M, et al. Developmental trajectories of body mass index in early childhood and their risk factors: an 8-year longitudinal study. *Arch Pediatr Adolesc Med*. 2011;165(10):906–12. doi:10.1001/archpediatrics.2011.153.

24. Utz RL, Reither EN, Waitzman N. Prenatal care, childhood obesity, and ethnic health disparities: analyses from a unique population database. *J Health Care Poor Underserved*. 2012;23(1):302–20. doi:10.1353/hpu.2012.0013.

25. Kenney C. Father doesn't know best? Parents' control of money and children's food insecurity. *J Marriage Fam*. 2008;70(August):654–669. Available at: http://onlinelibrary.wiley.com/doi/10.1111/j.1741-3737.2008.00512.x/full. Accessed July 19, 2012.

26. Barber SL, Gertler PJ. Empowering women: how Mexico's conditional cash transfer programme raised prenatal care quality and birth weight. *J Dev Eff*. 2010;2(1):51–73. doi:10.1080/19439341003592630.

27. Heckman JJ. The developmental origins of health. *Health Econ*. 2012;21(1):24–9. doi:10.1002/hec.1802.

28. Heckman JJ, Stixrud J, Urzua S. The Effects of Cognitive and Noncognitive Abilities on Labor Market Outcomes and Social Behavior. *J Labor Econ*. 2006;24(3):411–482. doi:10.1086/504455.

29. Conti G, Heckman J, Urzua S. The Education-Health Gradient. *Am Econ Rev*. 2010;100(2):234–238. doi:10.1257/aer.100.2.234.

30. Cunha F, Heckman J. The technology of skill formation. 2007. Available at: http://www.nber.org/papers/w12840.ack. Accessed July 10, 2012.

31. Johnson R, Schoeni R. The influence of early-life events on human capital, health status, and labor market outcomes over the life course. *J Econ Anal Policy*. 2011;11(2). Available at: http://escholarship.org/uc/item/71p310w1;via-ignore%3Drss. Accessed July 10, 2012.

32. Conti G, Heckman JJ. Understanding the Early Origins of the Education-Health Gradient: A Framework That Can Also Be Applied to Analyze Gene-Environment Interactions. *Perspect Psychol Sci*. 2010;5(5):585–605. doi:10.1177/1745691610383502.

33. Heymann J, Earle A. *Raising the Global Floor: Dismantling the Myth that We Can't Afford Good Working Conditions for Everyone*. Stanford, CA: University Press; 2010:111.

Appendix A

CONCEPTUAL MODEL

Figure 1.1 presents a conceptual model that illustrates the relationship between family-friendly attributes and health outcomes. This conceptual model guided the conceptualization, design, and analysis of the dissertation aims. Family-friendly attributes are important as they define "quality jobs" which have been shown to improve the well-being of working parents.[1,2] Traditionally, family friendly employment attributes include flexible schedules, paid leave (maternity leave, paid sick leave), and financial assistance (health care insurance, childcare subsidies.[3] This model defines employment attributes more broadly to include income and the psycho-social work environment (support, respect, workplace stress) in addition to the components cited above. This framework is an ecological model that considers work attributes to be external factors that directly and indirectly affect the family environment and individual-level outcomes. This dissertation examines how workplace attributes influence three specific outcomes; childhood obesity, depression among women with young children, and use of pediatric preventive care. Each study is framed within the context of this model to examine a specific pathway between relevant workplace attributes and the outcome. Here, I describe the model by providing definitions of the terms and explaining how the concepts are related and how they influence the health/health service outcomes of interest.

Use of pediatric preventive care (Aim 1)

I hypothesize that work schedule, schedule flexibility and paid leave are external employment-related attributes that influence use of pediatric preventive care outcomes including well-child visits, receipt of the flu vaccine, receipt of vision screening and general dental visits. In this model flexible, employee controlled, and day-time work schedules and paid leave create time flexibility that allows parents to manage family demands, such as doctor appointments.[3,4] Colle and Grossman use an economic analysis to explore the determinants of pediatric health care use. Their conceptual model posits that parental time and monetary resources are investments parents make in their children's' health. In other words, parents

choose to allocate time and potential lost wages for their children's health care instead of for other competing priorities.[5,6] The opportunity cost of one hour of time a working mother spends taking her child to visit the doctor can be evaluated by her hourly wage[5] which suggests that maternal employment may increase the opportunity cost of seeking pediatric health care.

Employment attributes can help families improve child health by reducing the time and monetary costs associated with health service use. For example, children whose mothers have flexible schedules and paid leave may have better compliance with the American Academic of Pediatrics (AAP) recommendations because their mothers can accompany them to seek preventive health services. These mothers are not foregoing wages and have time built into the day to attend to family needs. This assertion has been substantiated by research showing that children of mothers with access to benefits that reduce opportunity costs associated with addressing family demands, such as paid vacation and sick leave, receive more well and sick child visits.[4,6]

Maternal depression (Aim 2)

I hypothesize that day-time work schedule, schedule flexibility, paid leave, and the psycho-social work environment are external employment-related attributes that influence depression among women with infants. Further, relations between schedule flexibility and paid leave and depression are primarily mediated by work/family balance; the relation between work schedule and depression is partially mediated by work/family balance; and the psycho-social work environment has a direct influence on mental health outcomes. Work schedule describes the time of day when employees work (i.e. day (standard) vs. evening/night (non-standard)). Schedule flexibility indicates that employees may choose their stop and start times, job share, telecommute, work part time and use compressed work weeks.[3] Paid leave offsets potential wage losses parents incur from taking time off from work to be with a sick child or attend doctor appointments.[4,5] The psycho-social work environment is comprised of supervisor support,

respect for individual needs and aspirations, employee perceptions about their level of control over, and ability to perform, the tasks required.

Despite some conflicting evidence,[7] numerous studies show that workplace flexibility in the form of flex-time and job-sharing and working standard schedules are associated with reduced work/family conflict.[8–10] Postpartum women are particularly at risk as lack of schedule control is associated with higher degrees of psychological distress[2,11,12] possibly due to a increases in work/family conflict.[10] Work flexibility and paid leave most likely reduce time conflicts between work and home by giving employees control over when to complete their work-related tasks or address family matters.[7] Working a nonstandard schedule may contribute to family conflict because parents have more difficulty coordinating their family schedules and may be unable to participate in family activities and child events.[13] While schedule flexibility and paid leave most likely have positive effects on work/family balance among new mothers, working a non-standard schedule may negative effects. For example, Carlson and colleagues found that working a non-standard schedule increased work-family conflict for mothers, but this association was mitigated by enhanced schedule control.[10] Non-standard schedules may also directly contribute to psychological distress through distorted sleeping and eating patterns and disruption of the circadian rhythm.[14]

Indictors of poor psychosocial work environments, such as lack of supervisor/coworker and organizational support, high workload, high work pressure, and poor job control may place high psychological demands on workers resulting in high levels of stress that can manifest in negative mental health outcomes, such as depression.[15] Numerous studies have demonstrated that work conditions associated with beneficial work environments are associated with lower depression scores among women with young children.[2,11,15]

Work/family conflict occurs because of incompatibility between work and family roles, making participation in one or both spheres more difficult because of participation in the other.[16] The interference

of work with family creates stress due to feelings of not being able to manage family responsibilities which in turn contribute to psychological distress and depression.[17] Work/family conflict is a source of stress for women with infants and is directly related to poor mental health outcomes.[10,18,19]

Childhood overweight and obesity, health status and developmental outcomes (Aim 3)

I hypothesize that maternal income, an employment attribute, is associated with adolescent overweight and obesity, health status, and behavioral outcomes by increasing family-level monetary flexibility to invest in children's health and development. The developmental origins of health hypothesis posits that parental characteristics, such as education and income, lead to investments in children that affect cognitive and non-cognitive (time and risk preferences, self-regulation, self-esteem) capabilities and physical health. Maternal income, an important early life parental characteristic, is a determinant of monetary flexibility and as a woman's contribution to family income increases (both absolutely and relative to her spouse/partner) households are more likely to make investments in their children, such as food,[20] childcare,[21] and other goods,[22,23] that positively contribute to health and developmental outcomes, such as cognitive and non-cognitive skills.[24] In turn, these skills contribute to later positive effects, such as lower rates of obesity, improved health behaviors, and health status.[25,26] Children who develop these skills in early childhood may decrease their risk of becoming obese because characteristics such as self-regulation,[27–29] delaying gratification,[30] and high cognitive functioning[31] may help them to embrace positive nutrition and health behaviors over time.[32,33]

Socioeconomic and demographic factors

Socio-economic and demographic factors affect relations between workplace attributes and health/health service use. The association between socio-economic status and demographic factors and health and access to health care is well known.[34,35] However, there is also evidence that women, part-time workers, single parents, and low-income workers are less likely to receive health insurance, paid leave and schedule flexibility to offset time and monetary costs associated with family needs.[36] Further, there are

disparities even within the same companies as low paid workers tend to receive fewer benefits.[3,37] The fact that social disparities are mirrored in the workplace suggests that ensuring all workers have access to family friendly employment attributes may be an opportunity to redress some social inequalities. Social support is defined as the access to and use of individuals, groups or organizations in dealing with life challenges.[38] It is included in this model because of its role in moderating the relationship between workplace stressors and mental health outcomes. According to Pearlin's Stress Process theory, social support is protective against the negative effects of life stressors.[38] Lack of time and monetary flexibility and work/family conflict are all potential stressors for young families and therefore it is likely that social support mitigates these effects on stress outcomes, including psychological distress. Specifically, there is evidence that social support from supervisors, coworkers, and family members reduces the effect of poor workplace attributes on work/family conflict and health outcomes..[12,39–41] For example, supportive supervisors may encourage innovative schedule arrangements and support role balance for their employees which increases time flexibility and reduces work/family conflict.[39,42] Spousal support also reduces depression among working mothers with infants.[40] Some studies have even shown that social support influences physical health status[18] and the use of ambulatory pediatric care.[43]

Limitations: This model does not address workplace culture and support for individual workers who take advantage of these benefits nor does it capture employee perceptions of organizational benefits. Evidence shows that many employees don't take advantage of available benefits, such as paid leave or flexible schedules, because of concerns about career advancement, lack of supervisor support and high organizational time demands.[3,44] unfortunately, the information to test these hypotheses is not available in the datasets I have. Further, this model does not consider physical occupational exposures such as physical fatigue, injuries, or contact with noxious chemicals because these exposures are workplace/industry specific characteristics and I am primarily concerned with workplace attributes that influence all workers and their families regardless of industry and occupation. Finally, a fifth component

of "family friendly" employment attributes is education and counseling.[3] These attributes are not included in the present model because I do not have information available to examine these attributes.

References

1. Strazdins L, Shipley M, Broom D. What does family-friendly really mean? Wellbeing, time and quality of parents' jobs. *Aust Bull Labor*. 2007. Available at: http://www.thefreelibrary.com/What does family-friendly really mean? Wellbeing, time, and the...-a0173643846.

2. Cooklin AR, Canterford L, Strazdins L, Nicholson JM. Employment conditions and maternal postpartum mental health: results from the Longitudinal Study of Australian Children. *Arch Womens Ment Health*. 2011;14(3):217–25. doi:10.1007/s00737-010-0196-9.

3. Friedman DE. Employer supports for parents with young children. *Future Child*. 2001;11(1):62–77. Available at: http://www.ncbi.nlm.nih.gov/pubmed/11712457. Accessed December 23, 2012.

4. Hamman MK. Making time for well-baby care: the role of maternal employment. *Matern Child Health J*. 2011;15(7):1029–36. doi:10.1007/s10995-010-0657-9.

5. Colle A, Grossman M. Determinants of pediatric care utilization. *J Hum Resour*. 1978;XIII(Supp 1978):115–158.

6. Vistnes JP, Hamilton V. The time and monetary costs of outpatient care for children. *Am Econ Rev*. 1995;85(2):117–21. Available at: http://www.ncbi.nlm.nih.gov/pubmed/10160522. Accessed July 17, 2012.

7. Joyce K, Pabayo R, Critchley JA, Bambra C. Flexible working conditions and their effects on employee health and wellbeing. *Cochrane Database Syst Rev*. 2010;(2):CD008009. doi:10.1002/14651858.CD008009.pub2.

8. Allen TD. Family-Supportive Work Environments: The Role of Organizational Perceptions. *J Vocat Behav*. 2001;58(3):414–435. doi:10.1006/jvbe.2000.1774.

9. Frye NK, Breaugh JA. Family-Friendly Policies, Supervisor Support, Work-Family Conflict, Family-Work Conflict, and Satisfaction: A Test of a Conceptual Model. *J Bus Psychol*. 2004;19(2):197–220. doi:10.1007/s10869-004-0548-4.

10. Carlson DS, Grzywacz JG, Ferguson M, Hunter EM, Clinch CR, Arcury TA. Health and turnover of working mothers after childbirth via the work-family interface: an analysis across time. *J Appl Psychol*. 2011;96(5):1045–54. doi:10.1037/a0023964.

11. Dagher RK, McGovern PM, Alexander BH, Dowd BE, Ukestad LK, McCaffrey DJ. The psychosocial work environment and maternal postpartum depression. *Int J Behav Med*. 2009;16(4):339–46. Available at: http://www.ncbi.nlm.nih.gov/pubmed/19288209. Accessed July 25, 2012.

12. Dagher RK, McGovern PM, Dowd BE, Lundberg U. Postpartum depressive symptoms and the combined load of paid and unpaid work: a longitudinal analysis. *Int Arch Occup Environ Health*. 2011;84(7):735–43. Available at: http://www.ncbi.nlm.nih.gov/pubmed/21373878. Accessed July 25, 2012.

13. Staines GL, Pleck JH. Nonstandard work schedules and family life. *J Appl Psychol*. 1984;69(3):515–523. doi:10.1037//0021-9010.69.3.515.

14. Kolla BP, Auger RR. Jet lag and shift work sleep disorders: how to help reset the internal clock. *Cleve Clin J Med*. 2011;78(10):675–84. doi:10.3949/ccjm.78a.10083.

15. Nieuwenhuijsen K, Bruinvels D, Frings-Dresen M. Psychosocial work environment and stress-related disorders, a systematic review. *Occup Med (Lond)*. 2010;60(4):277–86. doi:10.1093/occmed/kqq081.

16. Greenhaus JH, Beutell NJ. Sources of Conflict between Work and Family Roles. *Acad Manag Rev*. 1985;10(1):76. doi:10.2307/258214.

17. Frone MR, Barnes GM, Farrell MP. Relationship of Work-Family Conflict to Substance Use among Employed Mothers: The Role of Negative Affect. *J Marriage Fam*. 1994;56(4):1019. doi:10.2307/353610.

18. Grice MM, Feda D, McGovern P, Alexander BH, McCaffrey D, Ukestad L. Giving birth and returning to work: the impact of work-family conflict on women's health after childbirth. *Ann Epidemiol*. 2007;17(10):791–8. Available at: http://www.ncbi.nlm.nih.gov/pubmed/17719242. Accessed July 25, 2012.

19. Grice MM, McGovern PM, Alexander BH, Ukestad L, Hellerstedt W. Balancing work and family after childbirth: a longitudinal analysis. *Womens Health Issues*. 2011;21(1):19–27. Available at: http://www.ncbi.nlm.nih.gov/pubmed/21185988. Accessed July 25, 2012.

20. Kenney C. Father doesn't know best? Parents' control of money and children's food insecurity. *J Marriage Fam*. 2008;70(August):654–669. Available at: http://onlinelibrary.wiley.com/doi/10.1111/j.1741-3737.2008.00512.x/full. Accessed July 19, 2012.

21. Phipps SA, Burton PS. What's Mine is Yours? The Influence of Male and Female Incomes on Patterns of Household Expenditure. *Economica*. 1998;65(260):599–613. doi:10.1111/1468-0335.00148.

22. Attanasio O, Lechene V. Tests of income pooling in household decisions. *Rev Econ Dyn*. 2002;5(4):720–748. Available at: http://discovery.ucl.ac.uk/15171/.

23. Ward-Batts J. Out of the Wallet and into the Purse: Using Micro Data to Test Income Pooling. *J Hum Resour*. 2008;42(2):325–351. Available at: http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ792697. Accessed July 12, 2012.

24. Yeung W, Linver M. How money matters for young children's development: Parental investment and family processes. *Child Dev*. 2002;73(6):1861–1879. Available at: http://onlinelibrary.wiley.com/doi/10.1111/1467-8624.t01-1-00511/abstract. Accessed July 9, 2012.

25. Conti G, Heckman J, Urzua S. The Education-Health Gradient. *Am Econ Rev*. 2010;100(2):234–238. doi:10.1257/aer.100.2.234.

26. Johnson R, Schoeni R. The influence of early-life events on human capital, health status, and labor market outcomes over the life course. *J Econ Anal Policy*. 2011;11(2). Available at: http://escholarship.org/uc/item/71p310w1;via-ignore%3Drss. Accessed July 10, 2012.

27. Francis LA, Susman EJ. Self-regulation and rapid weight gain in children from age 3 to 12 years. *Arch Pediatr Adolesc Med*. 2009;163(4):297–302. doi:10.1001/archpediatrics.2008.579.

28. Graziano PA, Calkins SD, Keane SP. Toddler self-regulation skills predict risk for pediatric obesity. *Int J Obes (Lond)*. 2010;34(4):633–41. doi:10.1038/ijo.2009.288.

29. Evans GW, Fuller-Rowell TE, Doan SN. Childhood cumulative risk and obesity: the mediating role of self-regulatory ability. *Pediatrics*. 2012;129(1):e68–73. doi:10.1542/peds.2010-3647.

30. Seeyave DM, Coleman S, Appugliese D, et al. Ability to delay gratification at age 4 years and risk of overweight at age 11 years. *Arch Pediatr Adolesc Med*. 2009;163(4):303–8. doi:10.1001/archpediatrics.2009.12.

31. Riggs NR, Spruijt-Metz D, Sakuma K-L, Chou C-P, Pentz MA. Executive cognitive function and food intake in children. *J Nutr Educ Behav*. 2010;42(6):398–403. doi:10.1016/j.jneb.2009.11.003.

32. Hartmann AS, Czaja J, Rief W, Hilbert A. Personality and psychopathology in children with and without loss of control over eating. *Compr Psychiatry*. 2010;51(6):572–8. doi:10.1016/j.comppsych.2010.03.001.

33. Van den Berg L, Pieterse K, Malik JA, et al. Association between impulsivity, reward responsiveness and body mass index in children. *Int J Obes (Lond)*. 2011;35(10):1301–7. doi:10.1038/ijo.2011.116.

34. Simpson L, Owens PL, Zodet MW, et al. Health care for children and youth in the United States: annual report on patterns of coverage, utilization, quality, and expenditures by income. *Ambul Pediatr*. 5(1):6–44. doi:10.1367/A04-119R.1.

35. Woolf SH, Jones RM, Johnson RE, et al. Avertable deaths associated with household income in Virginia. *Am J Public Health*. 2010;100(4):750–5. doi:10.2105/AJPH.2009.165142.

36. Galinsky E, Bond J. *Infants and Toddlers in out-of-home care*. (Cryer D, Harms T, eds.). Baltimore, MD: Paul Brookes Publishing; 2000:309–50.

37. Gray M, Tudball J. *Family-friendly work practices: differences within and between workplaces*. Melbourne, Australia; 2002:Report Number 7. Available at: http://www.aifs.gov.au/institute/pubs/resreport7/gray1.pdf.

38. Pearlin LI, Lieberman MA, Menaghan EG, Mullan JT. The stress process. *J Health Soc Behav*. 1981;22(4):337–56. Available at: http://www.ncbi.nlm.nih.gov/pubmed/7320473. Accessed July 25, 2012.

39. Jansen NWH, Kant I, Kristensen TS, Nijhuis FJN. Antecedents and consequences of work-family conflict: a prospective cohort study. *J Occup Environ Med*. 2003;45(5):479–91. Available at: http://www.ncbi.nlm.nih.gov/pubmed/12769054. Accessed June 8, 2012.

40. Killien MG. The role of social support in facilitating postpartum women's return to employment. *J Obstet Gynecol Neonatal Nurs*. 2005;34(5):639–46. doi:10.1177/0884217505280192.

41. McGovern P, Dowd B, Gjerdingen D, et al. Postpartum health of employed mothers 5 weeks after childbirth. *Ann Fam Med*. 2006;4(2):159–67. Available at: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1467019&tool=pmcentrez&rendertype=abstract. Accessed July 25, 2012.

42. Cortese CG, Colombo L, Ghislieri C. Determinants of nurses' job satisfaction: the role of work-family conflict, job demand, emotional charge and social support. *J Nurs Manag*. 2010;18(1):35–43. doi:10.1111/j.1365-2834.2009.01064.x.

43. Alexander CS, Markowitz R. Maternal employment and use of pediatric clinic services. *Med Care*. 1986;24(2):134–47. Available at: http://www.ncbi.nlm.nih.gov/pubmed/3945135. Accessed June 7, 2012.

44. Thompson CA, Beauvais LL, Lyness KS. When Work–Family Benefits Are Not Enough: The Influence of Work–Family Culture on Benefit Utilization, Organizational Attachment, and Work–Family Conflict. *J Vocat Behav*. 1999;54(3):392–415. doi:10.1006/jvbe.1998.1681.