Maternal Paid Leave Benefits and the Use of Pediatric Preventive Health Services: an Instrumental Variable Analysis

Abstract:

Introduction: Over 50% 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 for families. This study assesses whether these attributes influence compliance with American Academy of Pediatrics (AAP), the American Academy of Pediatric Dentistry (AAPD), the US Preventive Services Task Force (USPSTF), and the Committee on Immunization Practices recommended clinical preventive services for children.

Methods: This study uses data from the Medical Expenditure Panel Survey (n=3,369) to examine whether paid leave and work intensity were associated with receipt of recommended well child visits, general dental exams, preventive dental care, vision screening obesity screening, and flu shots among US children aged 0 to 17 years. We used residual inclusion instrumental variable models to test this relation.

Results: Consistent with previous research, fewer than half of all children received the recommended number of well-child visits and dental exams. Paid sick leave predicted a statistically significant increase in the marginal probability of complying with recommended well-child visits (0.17; 95% CI: 0.05, 0.26), dental exams (0.14; 95% CI: 0.009, 0.27), and preventive dental care (0.18; 95% CI: 0.05, 0.29). Paid vacation leave was not associated with an increased probability of pediatric preventive care use. Lower work intensity was associated with a higher probability of complying with well-child visits and annual flu shots.

Discussion: Select workplace policies may affect the probability that a child receives preventive care. These findings indicate that employment benefits may be one avenue to address low compliance with pediatric preventive care and provide justification for stronger federal policies that protect working parents and their children.

Introduction

Despite the presence of clear guidance from the American Academy of Pediatrics (AAP), US Preventive Services Task Force (USPSTF), and American Academy Pediatric Dentists (AAPD), many children in the United States do not receive the recommended preventive health and dental services.[1,2] Recent studies demonstrate that fewer than half of all children received a well-child visit[3] or dental exam[2] in the previous 12 months.

The underutilization of pediatric preventive care represents a missed opportunity for child health in the US. Well-child visits are the clinical service mechanism for delivering pediatric preventive care and promoting the receipt of immunizations, which are the most cost effective, lifesaving preventive intervention available.[4–7] Well child visits promote screening and the early identification of a range of conditions, including vision impairments and childhood overweight. Early dental exams and preventive care help to identify and reduce the incidence dental caries,[8] which is the most common health problem among children and is highly predictive of carries in later childhood. [9] Compliance with pediatric preventive health and dental care may reduce the need for avoidable, expensive health care.[10,11] For example, very young children who received all recommended well-child visits were less likely to be hospitalized or visit the emergency room.[10,11] Publically insured children who were in full compliance with the AAP recommended well-child visits were 48% less likely to experience an avoidable hospitalization.[11] Early preventive dental care has also been shown to reduce the use of costly emergency and restorative care.[12,13] Finally, socio-demographic characteristics including insurance status, race/ethnicity, and maternal marital status, maternal education, and child age, predict access to pediatric preventive health services[3,14,15] indicating a critical need to address access to services for vulnerable children.

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.[16] This has motivated a considerable amount of academic research about the association between maternal employment and family health outcomes, including the use of pediatric health services. The research that exists about the relation between maternal employment and the use of preventive child health services is inconsistent, but some studies suggest that maternal employment and specific employment attributes, such as work intensity and paid time off, are associated with the number of well-child visits young children receive.[17–20] One study found that children aged 14 months or less whose mothers worked full time had 0.18 fewer visits in a year than those children with unemployed mothers; further each additional hour of working time slightly reduced the number of visits. Another study which considered the association between maternal employment attributes and sick child visits found that children whose mothers worked full time received 29.1% fewer sick child visits and children whose mothers worked part time received 22.6% fewer sick visits when compared with children whose mothers did not work. However, paid sick time increased the number of sick child visits for children with employed mothers by 27%.[20] The research about maternal work attributes and well-child visits for very young children is meager and there is virtually no evidence about this relation for adolescent children or the relation between work attributes and other preventive care services. Strengthening evidence about how employment-related attributes can influence the health of parents and their children is critical to advocate for the implementation of federally mandated workplace benefits that ensure the protection of workers and their families.

This study contributes to the evidence base about the relation between maternal work attributes and child health by examining the contribution work attributes to the use of preventive pediatric health services among children aged 0 and 17. The clinical service outcomes to be examined are well-child visits, components of well child visits, including vision screening, obesity screening and the receipt of the flu vaccine, dental exams and preventive dental care. 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. Further, this study examines how socio-economic and demographic characteristics, including family income, maternal education, marital status and child age, moderate the association between work attributes and pediatric service utilization.

Conceptual Framework

The Andersen-Newman model of health care utilization suggests that health care use is influenced by family and individual level characteristics.[21] This model recognizes three groups of predictors at the individual/family level--predisposing characteristics, enabling resources and need factors. There is a significant amount of research about the predisposing and need characteristics that predict compliance with recommended pediatric preventive care. These include older maternal age, advanced maternal education, marital status, fewer children in the household, race/ethnicity and child age.[3,14,15,18,22–26] Family income is an example of enabling resources.[21,26,27] We hypothesize that maternal workplace attributes may also be enabling resources that predict the use of pediatric preventive health services.

Time and monetary costs influence the relation between maternal employment attributes and use of well child services. Working women that do not receive paid time off may have a disincentive to forgo income in favor of a well-child checkup.[17,18] In other words, parents choose to allocate time and potential lost wages for their children's health care instead of for other competing priorities.[17,20] 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[17] which suggests that maternal employment may increase the opportunity cost of seeking pediatric health care. Therefore, paid leave and work intensity create flexibility that allows parents to manage family demands by offsetting the time and monetary costs associated with preventive health services.[18,28] This also indicates that families for whom foregone income may represent greater opportunity costs (i.e. young, less educated or lower-income mothers) may receive the greatest benefit from such workplace attributes.

This project will examine a relatively understudied research question. Maternal employment attributes could be an important determinant of receipt of preventive child health care services, yet little is known about the relation between workplace attributes and well-child visits and there is virtually no evidence about how employment attributes are associated with components of well-child visits and preventive dental care. In addition, the majority of research that exists focuses on young children, but preventive care for adolescents is critical especially as teenagers are the least likely group to comply with well-child visits.[3] Finally, we have found no studies that examined how factors, including SES and demographic factors, moderate these relations. This study is innovative in that it sets the question of whether maternal employment characteristics influence pediatric preventive care utilization within the context of the Anderson and Newman model of health service use to understand how socioeconomic disparities contribute to this association.

Methods

Data Source

This study uses data 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 (2007 and 2008). These datasets include cross sectional information about a large sample of the civilian, non-institutionalized US population. MEPS contains information about most of the health care use outcomes, maternal employment characteristics and individual characteristics. MEPS is a panel survey that follows participants in each panel for 2 years and conducts 5 rounds of data collection during those years. The NHIS contains annual, point-in-time information about receipt of the flu shot.

Sample

The study sample comprises all children aged 0-17 in the MEPS Household Component (HC) database who resided with their mother and whose mothers were employed in the same job during all 5 panel survey rounds. Children whose mothers were self-employed were excluded. The study sample for the flu vaccine is slightly different. This sample contains all children from the MEPS HC sample who were linked to the NHIS sample and whose mothers were employed at the same job during the year that the NHIS data were collected. For example, children in the MEPS Panel 14 sample were included if they were linked to the NHIS 2008 sample and their mothers were employed at the same job when they were surveyed for both MEPS and NHIS.

Variables

Outcome variables: The outcome variables from MEPs are the compliance with AAP recommended age-appropriate well-child visits for children aged 0-17 years, the receipt of a dental exam in the past 12 months for children aged 1-17 years, receipt of preventive dental care in the past 12 months for children aged 1-17 years, compliance with USPSTF recommendation for the receipt of vision screen in the past 12 months for children aged 3-6 years and receipt of BMI screening in the past 12 months for children aged 6-17 years. The outcome variable from the NHIS is the receipt of the flu vaccine in the past 12 months for children aged 6 months-17 years.

MEPS provides information about the total number of preventive physical health visits, dental exams and preventive dental interventions that each participant receives during each year of the panel survey. We constructed the well-child visit outcome by defining whether each child had received the number of visits recommended by the AAP during year 2 of the panel. Children who met this requirement were considered to have achieved compliance and were given a value of 1; those who did not were given a value of 0.

Children aged 1-17 who had received at least one dental exam in the past 12 months (as assessed during year 2) were considered to have achieved compliance (code=1). Children who had received fluoride treatment, sealants, or a teeth cleaning in the past year (as assessed during year 2) were considered to have received preventive dental care (code=1). The USPSTF recommends that children aged 3-5 receive a vision screen each year and that children aged 6-17 have a BMI check every year. These variables are contained in the MEPS preventive care questionnaire and are asked during rounds 2 and 4 of the survey. We used the vision screening outcome measured at time 4. Children who had reportedly received a vision screening in the past 12 months were given a value of 1 and otherwise were given a value of 0. The BMI outcome was constructed by using data from the reported height and weight for each child. If the parent reported that the doctor had recorded the child’s weight and height in the past 12 months the child was given a value of 1 and otherwise was coded as 0.

The MEPS survey sample uses the NHIS sample from the previous year. For example, the MEPS Panel 13 (2008-2009) uses the NHIS sample from 2007. Therefore, the flu shot outcome is only applicable to children in the MEPS Panel 13 survey who were born in 2007 and those born after 2007 were not included in this sample. Children who reportedly received the flu shot in 2007 and whose mothers worked at the same job when interviewed for MEPS were given a code of 1 and otherwise 0.

Predictor Variables: The primary predictor variables for this study are taken from the MEPS dataset and measured in round 1. Both paid sick and vacation leave are coded as yes=1 and no=0. We constructed the work intensity variable by taking the mean number of hours worked per week across the 3 rounds from year 1 and categorizing the mean into low part time (>20 hours/week), high part time (<=19 to 34 hours/week), low full time (=>35 to 50 hours/week) and high part time (50+ hours/week). The US Census Bureau defines part time work as 1-34 hours per week.

Modifying Variables: The modifying variables are child age (categorized 0-5, 6-10,11-14,15-17), maternal marital status (married/not married), family income (categorized into quartiles), and maternal education (not completed high school, completed high school, completed more than high school).

Confounders: The observed confounding variables were selected based on their association with both the predictors and outcome variables as defined in the literature and the conceptual model. These include child health status, child age, mother's race/ethnicity, mother's age, mother's education, mother's marital status, number of children in the household, family income, maternal paid leave, maternal work intensity, and father employment status. The role of "father" was defined by existing family linking variables in the MEPS dataset.

Endogeneity and instrumental variables: Selection bias may pose a significant challenge for this study. It is possible that employed women are different from those who choose not to work or to work less when their children are young. Previous studies suggest that women who received less generous employer benefits were less likely to return to work after they gave birth.[18] Further, other personal factors, such as family needs, stress, and personality that are not captured in the datasets may be associated with decisions about employment context, workplace benefits, and use of pediatric preventive care. Therefore, we may be capturing a subset of working mothers who either had access to or chose better working conditions and benefits due to unobservable characteristics.

We use instrumental variables (IV) to account for potential unobserved selection bias. IVs are associated with the predictor of interest and not the outcome variable and therefore serve to randomize subjects across levels of the IVs and account for endogeneity. Instrumental variables must meet two requirements to justify their use. The first is that the instrument must be strongly related to the primary predictor. The second requirement is that the instrument is not related to the outcome and therefore does not confound the relation between any variable in the model and the outcome.

Several potential IVs were considered including industry code, occupation code, retirement plan and union status. However, concerns about sample size (several of these variables were missing a large number of observations) and lack of validity prompted us to use the industry-specific mean of our primary predictors. The IVs are the industry-specific mean of work intensity and paid sick and vacation leave. For example, the instrumental variable for paid sick leave was constructed by estimating the mean proportion of sick leave by industry code. We also constructed the industry-specific mean rate of compliance with each outcome and included this as a covariate in the analytical models.

Analysis

We describe respondent characteristics using standard descriptive statistics. We used a naïve logistic regression and a residual inclusion IV analysis to understand the association between maternal employment attributes and use of preventive pediatric services. The naïve logistic regression and IV models were specified using the same covariate vector. We tested whether our IVs met the required assumptions by regressing each maternal employment attribute on the associated instrument and other covariates. We examined the partial F-statistic of the instrument and significance level. We then examined the balance of each endogenous covariate across two levels of each IV (paid leave IVs were cut at the median, work intensity IV was cut into quartiles to enhance comparison with the work intensity categorical variable) and assessed whether the covariates achieved better balanced across levels of the IV than across levels of the maternal work attribute variables.

We analyzed the relation between each primary predictor and outcome separately. For each we estimated a two stage residual inclusion model. There were three first stage equations, one for each primary predictor variables. Each of the 21 second stage equations included the predictor, the predictor-specific residual from the first stage equation, the industry-specific mean of the specific outcome being tested, and all control variables. The equation assessing the effect of maternal employment attributes on obesity screening contained an interaction term between the primary predictor and primary predictor residuals from the Stage 1 equation because this term improved model fit. See Table 1 for a list of covariates and covariate forms contained in the Stage 1 and Stage 2 models.

The significance of modifying variables was tested by including an interaction term between each predictor and each modifying variable in each IV model. Significance was defined at $\alpha=0.05$.

We assessed model fit using the Hosmer-Lemeshow, Pearson Correlation and Pregibon Link tests. We predicted 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. Standard errors and 95% confidence intervals were estimated using bootstrapping techniques. All analyses used STATA IC 11. Analyses were not survey weighted.

We conducted sensitivity analyses comparing socio-economic and demographic characteristics and employment factors by whether an individual had any missing covariate observations.

Results

Table 2 describes (un-weighted) participant socio-demographic characteristics, mean employment attributes and mean outcomes. Missing data accounted for less than 10% of the sample and therefore a complete case analysis was conducted. Further, our sensitivity analyses suggest that participants in our dataset with missing observations were very similar to participants without missing observations.

Table 3 shows the results from the first stage equation. The partial F-statistic for each covariate and its significance level is displayed. These results demonstrate that each IV is strongly related to the primary predictor variables at $p<0.001$ and we conclude that each IV is sufficiently strong and satisfies the first assumption. We also compared the balance of the endogenous covariates across levels of each maternal workplace attribute to levels of the associated IV in order 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 (sick and vacation leave). The large majority of covariates achieved a greater balance across levels of the work intensity IV.

Table 4 compares the marginal probabilities and associated confidence intervals constructed using bootstrapped standard errors between the naïve logistic regression and the residual inclusion IV analyses. The IV models suggest that maternal employment attributes, especially paid sick leave, appear to drive the use of some preventive health services, including well child visits, dental exams and preventive dental care when controlling for numerous socio-economic, demographic, and employment factors. Associations are fairly high indicating that children whose mother's receive paid sick leave are <10% more likely to receive some preventive services. Paid vacation does not appear to influence the use of pediatric preventive care. Higher work intensity is associated with a reduction in well-child visits and receipt of the flu shot. The IV models demonstrate more consistent, stronger effects of maternal employment on use of pediatric preventive care services across all service use outcomes compared with the naïve logistic regression models. The statistical significance of the estimates for the well child visit, dental exam and preventive dental care models are assessed using percentile-based confidence intervals because the treatment estimates were not normally distributed.

Table 5 provides significance levels (p-values) for the interaction terms included in each model used to assess whether socio-demographic factors moderate the association between maternal employment attributes and use of pediatric preventive care. Maternal education and child age are important moderating factors. Maternal education moderates the association between the paid leave variables and well child visits, dental preventive care, and vision screening outcomes. Child age also moderates the association between paid leave and well child visits, dental preventive care and receipt of the flu vaccine. Family income and mother's marital status influenced a few of the associations, but we observed no consistent pattern.

Discussion

Our results suggest that maternal employment attributes, including paid sick leave and work intensity, are important drivers of preventive child health service utilization. This study supports the findings of other research that has also shown that workplace benefits increase preventive and acute outpatient care for children.[17–20] Our study extends the existing evidence base by examining a wider range of outcomes, including dental care, immunizations and USPSTF-recommended screenings, and assessing this relation among young children and adolescents. Further, we use instrumental variables to address potential bias due to endogeneity.

The findings we present are robust, despite the use of instrumental variables, which produce less efficient treatment effect estimators. Maternal employment attributes had the greatest impact on compliance with well-child visits, dental exams and preventive dental care. The consistency of our findings may have been attributed to the fact that these services are offered in outpatient settings and generally require a parent or other caretaker to accompany the child; hence, the use of these services would be influenced by a mother's time and monetary flexibility. It is possible that the children in the study received the screening services in other settings, such as school, explaining the lack of significance of our estimators for obesity and vision screening. School-based screening programs are common in the United States and ensure that children receive recommended preventive services without requiring parents to take time away from work. The Institute of Medicine has advocated for establishment of BMI measurement surveillance programs in schools to fight the obesity epidemic for almost a decade.[29] As of 2010, 40% of states require and 18% of states recommend school-based body composition or obesity screenings.[30,31] Further, over 80% of all states have some requirement for school vision screening.[32]

Work intensity was associated with receipt of the flu shot. We would also have expected that paid leave be associated with receipt of the flu shot, but our results did not support this hypothesis. A small proportion (12%) of children in our study had received the vaccine in the past 12 months. These data were collected in 2007 and 2008 by the NHIS; the same year that the CDC's Advisory Committee on Immunization Practices issued a recommendation that annual influenza vaccine coverage be expanded to include all school-aged children.[33,34] It is likely that there had not been sufficient uptake of this practice in our sample to detect a treatment effect attributable to paid leave. The effect size for work intensity was large across all outcomes which could explain our significant result for this particular outcome. Future research should examine this relation using data collected after 2008.

Paid sick leave emerged as the most important factor affecting use of pediatric preventive care. Paid sick leave increased the probability of complying with well-child visits and dental care by 14-17%. Paid vacation leave was not significantly associated with any pediatric preventive care outcome at α==0.05, but the treatment effect reached borderline significance for the dental care outcomes. Parents may be more likely to use paid sick leave rather than vacation leave to take their children to preventive care appointments. These findings suggest that paid sick leave may be an essential workplace benefit for improving compliance with recommended preventive care for children.

Work intensity was an important predictor of well child visits and the flu shot. Children whose mothers work 20-34 hours and 35-49 hours per week were 50-60% less likely to have received the recommended number of age-appropriate well child visits and a flu shot compared with children whose mothers work fewer hours (1-19 hours/week). This finding suggests that women who work between 20 and 50 hours per week may have difficulty meeting recommendations for pediatric preventive care.

Children of women who worked more than 50 hours per week were not less likely to receive such care compared with children of women who worked less than 20 hours per week. In several models, the children of women working 50+ hours per week had the smallest treatment effect. This makes sense considering that children of women who work 50+ hours per week may be able to afford comprehensive, non-maternal childcare, such as another parent or nanny, who can take the child to pediatric preventive care appointments. Also, these women may be entitled to more generous employment benefits giving them more time and monetary flexibility. The group of women working more than 50 hours per week was small (n=323) and this may have also contributed to large standard errors and a lack of statistical significance.

We find that the naïve logistic regression models provide inconsistent estimates of the association between maternal workplace attributes and use of care. For example, we would expect maternal employment attributes to have a similar directional effect on the use of care, but the logistic regression models provide weaker, contradicting results which may indicate the presence of unobserved bias and support the use of an IV to analyze this research question. Another surprising outcome was that the IV analyses yielded a higher proportion of statistically significant results. We would have expected the estimates in the naïve logistic regression to have been larger and more statistically significant due to unobserved confounding. IV analyses are more inefficient because the individuals being compared are those with varying levels of the instrument. However, it is possible that the relations between the unobserved variables in the naïve logistic regression acted together to down-weight the estimates and increase the standard errors.

This study extends previous research by considering, for the first time, how socio-economic and demographic factors moderate the association between maternal employment attributes and pediatric preventive care. The purpose of this research aim was to explore whether generous workplace benefits offset disparities in the receipt of pediatric preventive services. Key socio-economic factors, including more parental education, higher family income and younger child age are associated with compliance with well-child visits.[3] If these factors moderate the association of interest, then advocating for changes in workplace policies that promote time and monetary flexibility in female-dominated, low income industries becomes highly relevant. Our results show that maternal education influences several of these associations. Paid leave has a differential influence on the use of some pediatric preventive care services by level of maternal education. Child age also exerts a consistent effect on several associations, including paid leave and well child, dental preventive care and receipt of the flu vaccine. It is possible that younger children are more likely to get the recommended care[3] and that the absence of paid leave has a markedly negative effect on the use of care for older children. The role of maternal education is important and should be explored further so that policy efforts can be targeted to achieve the greatest impact.

Limitations and Conclusions

We did not apply survey weights in this analysis which will introduce some sampling bias. NHIS and MEPS use stratified cluster sampling; subjects are recruited from specific counties and neighborhoods by state. This could influence the findings if there are strong geographic service-use patterns or general community-level behaviors that influence employment and pediatric preventive care seeking. Further, our results are not nationally representative. There may also be slight bias because we did not account for clustering at the family level--all children in each household were included in our sample. This would exert bias if families with more children have consistently different patterns of health service use and employment factors compared with families with fewer children, but we controlled for number of children in the household in all the analytic models. Excluding women who changed jobs during the survey was an attempt to minimize bias due to negative employment attributes that we were unable to control for. However, this exclusion restriction may make our results less representative because our sample only includes children whose mothers were more motivated to stay at their particular job for at least 2 years. Also, the survey items used in this analysis were derived from parent/caregiver self-report and may be subject to recall and reporting bias.

We used an instrumental variable (IV) approach to improve causal interpretations, but IV methods still have numerous limitations that may challenge the interpretation of these findings. For example, it is impossible to test all the IV assumptions including whether the IV is valid (i.e. whether it balances groups across unobserved confounders). Further, an IV analysis assumes that there is a homogenous treatment effect across individual characteristics. This may not be true in which case the estimates presented would not accurately describe the treatment effects for individuals with different values of the covariates.

Despite these limitations, our study uses a large US-based sample to model the effect of maternal workplace attributes on use of preventive child health services. Further, we extended the previous literature by exploring this association among adolescents and by considering the role of socio-economic and demographic pre-disposing and enabling factors. This research question is not easily addressed using large-scale national datasets because few surveys collect family-level information about health service use and employment factors; MEPS is one of the few publically available datasets that can be used to study this question. We acknowledged the likelihood of endogeneity and used analytical techniques to account for unobserved selection. We suggest a few areas for further study, especially the effect of employment attributes on the receipt of the flu vaccine using data collected after the recent CDC influenza vaccine policy changes become more fully established. Other workplace attributes, including workplace flexibility and supervisor support may also be important drivers of the use of care and should be considered in future studies, if the data are available.

We found that paid sick leave exerted a strong influence on a number of pediatric preventive care outcomes, particularly well-child visits, dental exams and receipt of preventive dental care. Workplace policies may be important drivers of pediatric preventive health service use by providing time and monetary flexibility for working parents. These findings indicate that employment benefits may be one avenue to address low compliance with pediatric preventive care and provide justification for stronger federal mandates for benefits that protect working parents and their children.

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TABLE 1: Stage 1 and Stage 2 Model Covariates

	Stage 1	Stage 2
Child Age	(X)	(X)
0 to 5 years	*Ref*	*Ref* (well child, dental, and flu shot outcomes)
6 to 10 years		*Ref* (obesity outcome)
11 to 14 years		
15 to 17 years		
Mother Race/ethnicity	(X)	(X)
Hispanic		
Black non-Hispanic		
Asian non-Hispanic		
Other (including White)	*Ref*	*Ref*
Family Income Year 1	(X)	(X)
Q1	*Ref*	*Ref*
Q2		
Q3		
Q4	-	-
Family Income Year 2	(X)	(--)
Q1	*Ref*	
Q2		
Q3		
Q4		
Family Size	(X)	(X) (included as continuous variable)
1 child	*Ref*	
2 children		
3 children		
4+ children		
Child Health Status	(X)	(X)
Child has health insurance	(X)	(--)
Child has dental health insurance	(X)	(--)
Mother Education	(X)	(X)
> High School	*Ref*	
= High School		
< High School		
Mother Marital Status	(X)	(X)
Mother Age	(X)	(X)
>30 years	*Ref*	*Ref*
30 to 34 years		

35-39 years		
40-44 years		
<40 years		
Father Employed Year 1	(X)	(X)
Never	*Ref*	*Ref*
Sometimes		
Always		
Father Employed Year 2	(X)	(--)
Never	*Ref*	
Sometimes		
Always		
Paid sick leave	(--)	(X)
Paid vacation leave	(--)	(X)
Work Intensity Year 1	(X)	(X)
Low part time (1-19 hours/week)	*Ref*	*Ref*
High part time (20-34 hours/week)		
Low full time (35-49 hours/week)		
High full time (+50 hours/week)		
Work Intensity Year 2	(X)	(--)
Low part time (1-19 hours/week)	*Ref*	
High part time (20-34 hours/week)		
Low full time (35-49 hours/week)		
High full time (+50 hours/week)		
Industry-specific mean variables		
Industry-specific mean paid sick leave (IV)	(--)	(X) (paid sick leave equation only)
Industry-specific mean paid vacation leave (IV)	(--)	(X) (paid vacation leave equation only)
Industry-specific mean work intensity (IV)	(--)	(X) (work intensity equation only)
Industry-specific mean of each outcome	(--)	(X) (each industry specific mean only included in equations containing that outcome)
Stage 1 residuals	(--)	(X)
Residual interaction terms		
Sick leaveXstage 1 residual	(--)	(X) (obesity equation only)
Vacation leaveX stage 1 residual	(--)	(X) (obesity equation only)
Work intensityX stage 1 residual	(--)	(X) (obesity equation only)

(X) indicates that that covariate was included in the model; (--) indicates that that covariate was left out of the model

TABLE 3: Results from first stage equations (Partial F-statistic and significance level)

	Paid sick leave	**Paid vacation leave**	**Work intensity**
IV Variable (industry specific mean of each primary predictor)	116.06**	56.88**	13.14**
Child Age	1.06	0.2	0.84
Mother Race/Ethnicity	2.28	7.46**	3.87**
Family Income Year 1	1.69	0.2	3.55**
Family Income Year 2	3.18*	5.9**	2.32*
Family Size	1.9	1.04	2.12*
Child Health Status	0.17	1.45	0.91
Child health insurance status	2.59	0	1.18
Child dental insurance status	0.025	0.14	0.89
Mother Education	9.27**	5.45*	1.95
Mother Marital Status	6.65	0.36	1.8
Mother Age	2.26	1.31	3.23**
Father Employed Year 1	1.83	0.6	2.54*
Father Employed Year 2	0.84	0.44	0.96
Work Intensity Year 1	3.05*	2.33	-
Work Intensity Year 2	1.9	5.99**	-
Occupation Code	9.52**	12.31**	3.6**

***Indicates significance at p<0.001*

** Indiciates significance at p=0.05*

TABLE 4: Marginal Probabilities (95% CI) from the Second Stage IV Residual Inclusion Model and from the Naïve Logistic Regression Model

	Well Child Visits		Dental Exam		Dental Preventive Care		Obesity Screening		Vision Screening		Flu Shot	
	Logistic Model	IV Model	Logistic Model	IV Model	Logistic Model	IV Model	Logistic Model	IV Model	Logistic Model	IV Model	Logistic Model	IV Model
Paid Sick Leave	0.07* (0.02, 0.12)	0.17* (0.05, 0.26)	-0.0007 (-0.05, 0.05)	0.14* (0.009, 0.27)	-0.014 (-0.06, 0.04)	0.18* (0.05, 0.29)	0.007 (-0.05, 0.06)	0.05 (-0.10, 0.20)	0.11 (-0.006, 0.24)	0.22 (-0.05, 0.50)	0.05* (0.02, 0.08)	0.04 (-0.05, 0.13)
Paid Vacation Leave	-0.08* (-0.13, -0.03)	0.008 (-0.13, 0.14)	0.02 (-0.03, 0.08)	0.13 (-0.001, 0.25)	0.02 (-0.03, 0.07)	0.12 (-0.02, 0.23)	0.02 (-0.03, 0.08)	0.09 (-0.09, 0.27)	-0.8 (-0.19, 0.04)	0.13 (-0.19, 0.46)	-0.007 (-0.04, 0.03)	0.03 (-0.17, 0.11)
Work Intensity												
Low part time (1-19 hrs/week)	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
High part time (20-34 hrs/week)	-0.08 (-0.16, 0.006)	-0.55* (-0.64, -0.19)	-0.03 (-0.12, 0.05)	0.29 (-0.40, 0.65	-0.0004 (-0.09, 0.09)	0.21 (-0.47, 0.61)	0.004 (-0.08, 0.09)	-0.12 (-0.71, 0,46)	-0.07 (-0.23. 0.10)	-0.02 (-0.61, 0.56)	-0.009 (-0.08, 0.06)	-0.64* (-1.1, -0.20)
Low full time (35-49 hrs/week)	-.04 (-0.12, 0.04)	-0.55* (-0.77, -0.07)	-0.10* (-0.18, -0.02)	0.20 (-0.33, 0.41)	-0.08 7 (-0.16,0.008)	0.08 (-0.40, 0.37)	-0.07 (-0.15, 0.01)	-0.11 (-0.47, 0.26)	-0.06 (-0.21, 0.09)	-0.32 (-0.82, 0.17)	-0.03 (0.09, 0.04)	-0.67* (-1.00, -0.32)
High full time (+50 hrs/week)	-0.10 (-0.20, -0.02)	-0.21 (-0.60, 0.20)	-0.09 (-0.18, 0.006)	-0.02 (-0.53, 0.44)	-0.05 (-0.15, 0.04)	-0.10 (-0.62, 0.41)	-0.09 (-0.19, 0.02)	0.11 (-0.51, 072)	-0.11 (-0.30, 0.09)	-0.30 (-1.02, 0.43)	-0.01 (0.09, 0.06)	0.14 (-0.20, 0.49)

** Indicates that the marginal probability was significant at α=0.05*
Percentile-based CIs are provided for well child visit, dental exam, and dental preventive care models as bootstrapped estimates were not normally distributed
Vision model included maternal age category as a grouped linear instead of an indicator variability to reduce colinearity in replicate bootstrap samples

TABLE 5: Significance of interaction between primary predictors and socio-demographic variables

	Well Child Visit	Dental Exam	Preventive Dental Care	Obesity Screening	Vision Screening	Flu Shot
	p value	p value	p value	p value	p value	p value
Paid sick leave						
Sick leave X Child age	0.05*	0.09	0.005*	0.61	(--)	0.03*
Sick leave X Mother matial status	0.22	0.56	0.88	0.02*	0.14	0.35
Sick leave X Family income	0.07	0.58	0.82	0.02*	0.89	0.20
Sick leave X Mother education	0.009*	0.22	0.03*	0.58	0.005*	0.37
Paid vacation leave						
Paid leave X Child age	0.19	0.62	0.47	0.08	(--)	0.57
Paid leave X Mother marital status	0.14	0.25	0.18	0.25	0.07	0.12
Paid leave X Family income	0.09	0.70	0.81	0.14	0.84	0.42
Paid leave X Mother education	0.03*	0.26	0.02*	0.85	0.007*	0.34
Work intensity						
Work intensity X Child age	0.31	0.69	0.72	0.43	(--)	0.07
Work intensity X Mother marital status	0.14	0.96	0.87	0.75	0.43	0.83
Work intensity X Family income	0.009*	0.42	0.20	0.50	0.28	0.69
Work intensity X Mother education	0.31	0.71	0.21	0.66	0.03*	0.81