**Social Drivers of Health and Healthcare Utilization among Families**

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**Introduction**

Social determinants of health require social services and delivery systems to address the needs of families, especially those who are low-income and live in poorly resourced communities. The United States is unique among industrialized nations with respect to the distribution of its resources to address health. Despite a public health awareness that social, behavioral, environmental and physical factors contribute 80% to modifiable influences to health, compared to healthcare contributing only 20% (Tarlov, 1999), the U.S. spends $2 on healthcare for every $1 spent on social care and services. This is an inverse relationship of focused health spending to other prosperous countries (Bradley, Taylor & Bradley, 2013).

The objectives of this study are to assess healthcare utilization and patterns within families, specifically to what degree do parental-level factors influence children’s healthcare; and to study the relative effects of social determinants within families and across communities.

**Methods**

We pooled 2011- 2013 Medical Expenditure Panel Survey (MEPS) data to examine the use of health services and medical expenditure among children and parents to investigate whether the children of parents who are super-utilizers are super-utilizers themselves. MEPS is a nationally representative survey of civilian, non-institutionalized populations, administered by the Agency for Healthcare Research and Quality (AHRQ). MEPS provides national estimates of the use of health services, medical expenditures, insurance coverage and payment sources for all individuals residing in the United States. Data was collected across five rounds of interviews over two full years.

Hispanics, Blacks, and Asians are oversampled to obtain precision in estimates for these minority populations. Using the personal identification number attached to an individual in MEPS, we identified records of children and linked them with identification numbers assigned to mother and father in a family, which resulted in 28,650 mother-child and 19,802 father-child dyads. Annual response rates for the survey years 2011, 2012 and 2013 were 54.9%, 56.3%, 52.8% respectively.

We used population health indicators derived from 2008-2012 American Community Survey Summary File to examine the association between healthcare utilization rates and the indices of deprivation. As the geographic-level measures (Census Tract) were not available in the MEPS public-use data, we conducted a part of the analysis that involved investigation of influence of contextual factors on children of high-cost healthcare the analysts at the Agency for Healthcare Research and Quality (AHRQ) . Analysts at the AHRQ data center linked the ACS data to the MEPS data.

Institutional Review Board, American Academy of Family Physicians approved/exempted this study from because it involved secondary data analysis of the MEPS data.

**Study Measures**

***Outcome measures***

Primary outcome measures were medical expenditure for the child and child’s utilization of healthcare system represented by a number of ER visits and hospital stays. Dichotomous variables for ER visit and hospital stays were created with one indicating that child had at least one ER visit or hospital stay and zero meaning no ER visit or hospital stays. We included child’s self-reported physical health status as an intermediary outcome measure. Five categories of reported health status included: (1) Excellent, (2) Very good, (3) Good, (4) Fair and (5) Poor.

***Parents’ Utilization of Health Services***

Independent variables included medical expenditure, ER visits and hospital stays of parents. We used total medical expenses incurred, and use of healthcare system measured by the number of ER visits and hospital stays separately for each of the parents in a family. We created binary variables for ER visits and hospital stays, with one indicating that mother or father had at least an ER visit or hospitalizations in the past 12 months otherwise zero.

***Covariates***

***Child’s characteristics***

We included the following demographic characteristics of children - age, gender, race/ethnicity, the region as covariates. In addition, mental health, Columbia Impairment Scale (CIS), and diagnosis of asthma, diabetes, and ADHD in children were used. CIS consists of several measures related to child’s behaviors at school or job and home; emotions of sadness and anxiety; and interactions with peers, parents, and other adults. We created a composite score of measures mentioned above.

Based on the residence of the children, they were grouped in four census regions (1) South, (2) Northeast, (3) Midwest and (4) West. We created four race and ethnicity groups: 1) Non-Hispanic Whites, (2) Non-Hispanic Blacks, (3) Hispanics and (4) Other. Asians, Native Hawaiian/Pacific Islander, and American Indian/Alaskan Natives were combined to create the other group.

***Parents’ Characteristics***

Parents’ covariates included demographic characteristics of parents (father or mother) - age, education, insurance coverage, income, and marital status. Based on educational attainment we created three categories ¬- 1) less than 12 years of education, 2) a high school degree or general education development (GED), and 3) post-high school degree. We categorized insurance as private, public, or uninsured. Individuals were considered privately insured if they were covered by private insurance at any point in the year. They were classified as publicly insured if they were covered by Medicaid or Medicare at some time in the year but never private insurance. The uninsured were neither covered by public nor private insurance at any point in the year. We included five categories for income: (1) less than 100% Federal Poverty Level (FPL), (2) 100 -124 % FPL, (3) 125-199% FPL, (4) 200 -399% FPL and (5) greater than or equal to 400% FPL. For assessing marital status we created five categories - married, widowed, divorced, separated and never married.

We used physical component scores as a measure of physical health status in parents. Physical Component scores are summary scores on Short Form-12 (SF-12) questionnaire, which is a part of Self-Administered Questionnaire (SAQ)). SAQ is a paper and pencil survey administered to non-institutionalized and civilian US adults (18 years and over) in English or Spanish. SF 12 version (2) ® includes 12 questions related to physical and mental health status of the individuals. The scores on these questions are summarized into Physical Component (PCS) and Mental Component Scores (MCS) based on a standard algorithm. (MEPS- SAQ).

***Contextual Factors***

Contextual factors were derived from the American Community Survey (ACS) Five-Year Summary File (2008-2012) at the census tract. The following measures were included - (1) less than 100% Federal Poverty level (FPL) and, (2) geographical mobility less than 150% FPL. We also included United States Department of Agriculture Food Access measure -low-income- low access census tract with at least 33% population living more than one mile in a rural area or ten miles in an urban area from the nearest supermarket. Additionally, we used social deprivation index (SDI) derived from the ACS (2008-2012) estimates. SDI is a composite measure of the percentage of poor (<100%FPL), rented, crowded housing units, single parent families, non-employed, high needs age group, no car and, <12 years of education at the census tract.

***Statistical Analysis***

Statistical analysis was performed using Stata 14.0. We used sampling weights and survey variables for post-stratification, clustering, and complex sample design provided in MEPS to obtain accurate nationally representative estimates in our results. We computed summary statistics and reported the number and percentages of children in the sample. Bivariate analysis was performed using Chi-squared tests on categorical variables and t-tests for continuous variables.

Medical expenditure for both parents and children was grouped into ventiles, by dividing the sample into 20 groups consisting of an equal number of survey respondents in each of the groups. The subjects in the top 5% of medical expenditures for each group (child, mother, father) were identified as super-utilizers. Similarly, each of the contextual factors was grouped into quintiles.

Binary logistic regression models were estimated for each of the outcome measures - ER visits, hospital stays and super- utilizer status in children, using parents’ utilization of health services and medical expenses as independent variables. Separate models were used for mother and for father.

For all the outcomes (ER visits, hospital stays and super-utilizer child) we included child’s demographic characteristics in the first model, added child’s chronic conditions in the second, and both child’s and mothers’ or fathers’ covariates in the third model. Finally, we added contextual factors in the last regression model.

**Results**

Children who had an ED visit were substantially more likely to have a mother who also had an ED visit in the course of a year (Table 1). Among children with an ED visit, 21.8% of their mothers also had an ED visit, compared to 12.5% for children without an ED visit (p<.001). There is a much weaker association of a child ED visit with the two other measures of mother's use of health services. Other bivariate results show that younger and less healthy children are more likely to have an ED visit. Children are also more likely to have an ED visit if their mother is poor and covered by public insurance.

Our multivariable results (Table 2) show that the likelihood of a child having an ED visit conditional on his or her mother having an ED visits remains significant after controlling for child and mother demographic and health characteristics (OR: 1.568, 95% CI: 1.311 to 1.876). Similarly, we find that the odds that a child is the top 5% of health care spenders is positively associated with mother’ spending level (Figure 1). The odds of high spending for a child are about 2.5 higher if the mother is also in the top 5% (OR 2.476, 95% CI: 1.717-3.571). More generally, the odds of an ED for a children increase steadily across the second half of the spending distribution of the mother (from the 10th ventile onwards). By contrast to our results for both ED visits and spending, there is no association between a mother’s and child’s hospitalization (OR: 0.895, 95% CI: 0.554 - 1.447).

Other multivariable results show, as expected, that children with poorer health are more likely to have ED visits and hospitalizations. For instance, children with asthma the odds ratio of an ED visit is 1.837 and the odd ratio for a hospitalization are odds of a hospitalization is 2.198. The odds of an ED visit are associated with mother’s education and marital status, but surprisingly not with poverty level. We also found that our contextual measure of poverty is not significant after adjusting for mother and child covariates.

Our final analysis focuses on the association between the census tract measure of poverty and both health care use and reported fair/poor health. The first model across each outcome includes no control variables, the second adds child characteristics and the third adds mother characteristics. With respect to ED visits, the unadjusted model shows that children living in high poverty areas (Quintile 5) have odds of an ED visit that are 40% (OR: 1.406, 95% CI: 1.124-1.758) greater than those living in a low poverty area (Quintile 1). This estimate is non-significant after controlling for child demographic and health characteristics in the second model as well the third model after adding mother’s characteristics. The pattern for spending is quite different. In the first unadjusted model, children in poorer area are significantly *less* likely to be in the top 5% of the spending distribution (OR: 0.690, 95% CI: 0.517 - 0.921). This effect persists after controlling for child characteristics; but after also controlling for mother characteristics, the effect of census tract poverty is not significant. This pattern mainly reflects the finding that children with more affluent and more educated mothers have higher spending.

Finally, we find that children living in the poorest areas have odds of poor or fair reported health three times greater than their counterparts in the least poor areas (OR 3.015, 95% CI: 2.272 - 4.002). This effect drops slightly have adjusted for child’s demographic characteristics, and is cut roughly in half but remains sizeable and significant in the third model with also controls for mother’s demographic characteristics.

|  |  |  |  |
| --- | --- | --- | --- |
| **Table 1. Bivariate Assoication between Child ED Visit and Mother and Child Characteristics** | | | |
|  |  | Child ED Visit | |
|  |  | No | Yes |
|  |  | % | % |
|  | Any ER Mother | 12.5 | 21.8 |
|  | Any Hospitalization Mother | 7.6 | 7.9 |
|  | High Spending Mother | 5.3 | 6.4 |
|  | Female | 49.4 | 46.0 |
| Age | 0-5 years | 23.5 | 32.1 |
|  | 6-10 years | 25.0 | 22.0 |
|  | 10-14 years | 32.0 | 25.9 |
|  | 15-17 years | 19.5 | 20.0 |
| Race/Ethnicity | NH\_White | 53.6 | 54.9 |
|  | NH\_Black | 13.7 | 15.5 |
|  | Hispanic | 23.7 | 22.2 |
|  | Other Race | 9.0 | 7.3 |
| Region | South | 16.4 | 17.9 |
|  | Northeast | 20.8 | 24.8 |
|  | Midwest | 37.9 | 37.4 |
|  | West | 24.8 | 19.9 |
|  | Poor/Fair Health | 2.3 | 5.4 |
|  | Columbia Impairment Score | 6.7 | 10.1 |
|  | Asthma | 6.2 | 11.9 |
|  | Hypertension | 0.1 | 0.3 |
|  | diabetes\_child | 0.5 | 0.8 |
| Schooling | < 12 years | 13.3 | 14.5 |
|  | 12 years | 23.7 | 27.2 |
|  | > 12 years | 63.1 | 58.3 |
| Poverty Level | <100% FPL | 19.4 | 25.6 |
|  | 100\_124% FPL | 6.0 | 6.7 |
|  | 125\_199% FPL | 16.1 | 16.5 |
|  | 200399% FPL | 30.2 | 28.6 |
|  | >400% FPL | 28.4 | 22.6 |
|  | Housing Instab\_mother | 1.7 | 2.2 |
| Insurance Type | Private | 66.2 | 61.2 |
|  | Public | 16.0 | 21.9 |
|  | Uninsured | 17.8 | 16.9 |
|  | Poor/Fair Health | 10.6 | 15.5 |
|  | Physical Component Score (SF12) | 51.91 | 50.49 |

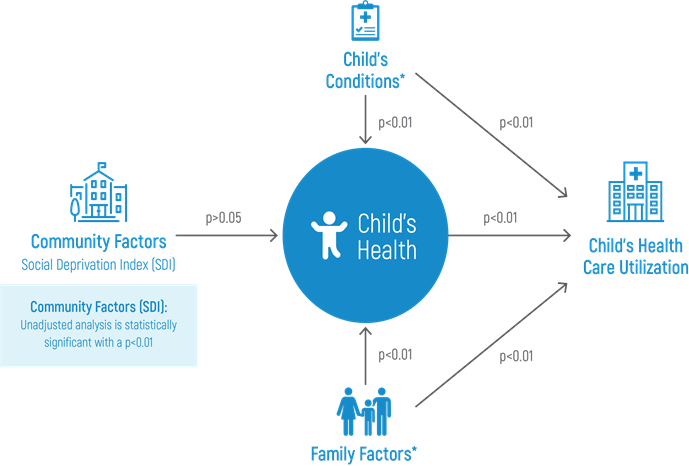
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| **Table 2. Factors Associated with a Child Having an ED Visit or a Hospitalization in Multivariable Analysis, MEPS** | | | | | | | |
|  |  | ER Visits | |  | Hospital Visits | |  |
|  | VARIABLES | OR | 95% CI |  | OR | 95% CI |  |
|  | Mother ED Visit | 1.568\*\*\* | 1.311 - 1.876 |  | --- |  |  |
|  | Mother Hospitalization | --- |  |  | 0.895 | 0.554 - 1.447 |  |
| Child Characteristics |  |  |  |  |  |  |  |
| Census Tract Poverty | Q1 | 1 (ref) |  |  | 1 (ref) |  |  |
|  | Q2 | 1.141 | 0.930 - 1.401 |  | 0.656\* | 0.426 - 1.011 |  |
|  | Q3 | 1.046 | 0.833 - 1.315 |  | 0.711 | 0.449 - 1.127 |  |
|  | Q4 | 1.190 | 0.928 - 1.526 |  | 0.748 | 0.491 - 1.139 |  |
|  | Q5 | 1.114 | 0.865 - 1.433 |  | 0.715 | 0.461 - 1.108 |  |
|  | Female (vs. Male) | 0.903 | 0.795 - 1.025 |  | 1.087 | 0.809 - 1.460 |  |
| Race/Ethnicity | NH White | 1 (ref) |  |  | 1 (ref) |  |  |
|  | NH Black | 0.872 | 0.728 - 1.046 |  | 0.945 | 0.617 - 1.447 |  |
|  | NH Other | 0.820 | 0.646 - 1.039 |  | 0.766 | 0.427 - 1.374 |  |
|  | Hispanic | 0.858 | 0.715 - 1.030 |  | 0.948 | 0.676 - 1.329 |  |
|  | Child Age | 0.970\*\*\* | 0.955 - 0.986 |  | 0.990 | 0.949 - 1.033 |  |
| Region | South | 1 (ref) |  |  | 1 (ref) |  |  |
|  | Northeast | 1.049 | 0.833 - 1.320 |  | 1.248 | 0.808 - 1.928 |  |
|  | Midwest | 0.958 | 0.757 - 1.212 |  | 1.307 | 0.880 - 1.939 |  |
|  | West | 0.787\*\* | 0.628 - 0.987 |  | 0.938 | 0.606 - 1.452 |  |
|  | Rural (vs. Urban) | 0.986 | 0.785 - 1.238 |  | 0.978 | 0.640 - 1.495 |  |
|  | asthma\_child | 1.837\*\*\* | 1.515 - 2.226 |  | 2.198\*\*\* | 1.609 - 3.004 |  |
|  | diabetes\_child | 1.364 | 0.674 - 2.761 |  | 2.707\* | 0.980 - 7.473 |  |
|  | adhd\_child | 1.305\*\* | 1.063 - 1.603 |  | 1.361 | 0.846 - 2.189 |  |
|  | mh\_child | 1.137\*\*\* | 1.051 - 1.231 |  | 1.516\*\*\* | 1.273 - 1.806 |  |
|  | cis | 1.224\* | 0.982 - 1.525 |  | 1.077 | 0.613 - 1.895 |  |
| Mother Characteristics | |  |  |  |  |  |  |
|  | age\_inyr\_mother | 0.989\*\* | 0.980 - 0.999 |  | 1.008 | 0.984 - 1.032 |  |
| Schooling | < 12 years Education | 1 (ref) |  |  | 1 (ref) |  |  |
|  | 12 years Education | 0.922 | 0.769 - 1.104 |  | 1.124 | 0.786 - 1.609 |  |
|  | > 12 years Education | 0.865\* | 0.740 - 1.011 |  | 1.026 | 0.706 - 1.490 |  |
| Insurance Type | Private | 1 (ref) |  |  | 1 (ref) |  |  |
|  | Public | 0.998 | 0.814 - 1.225 |  | 1.630\*\* | 1.099 - 2.416 |  |
|  | Uninsured | 0.935 | 0.781 - 1.120 |  | 1.097 | 0.771 - 1.561 |  |
| Poverty Level | GT /Equal to 400%FPL | 1 (ref) |  |  | 1 (ref) |  |  |
|  | 200-399% FPL | 1.045 | 0.837 - 1.304 |  | 1.656\*\* | 1.014 - 2.703 |  |
|  | 125-199% FPL | 0.993 | 0.762 - 1.295 |  | 1.583\* | 0.918 - 2.729 |  |
|  | 100-124% FPL | 1.023 | 0.755 - 1.388 |  | 1.108 | 0.524 - 2.345 |  |
|  | LT or Equal to 99% FPL | 1.079 | 0.837 - 1.389 |  | 1.299 | 0.702 - 2.402 |  |
| Marital Status | Married | 1 (ref) |  |  | 1 (ref) |  |  |
|  | Divorced | 1.261 | 0.799 - 1.991 |  | 1.812 | 0.762 - 4.304 |  |
|  | Widowed | 1.241\*\* | 1.013 - 1.520 |  | 1.529\* | 0.970 - 2.410 |  |
|  | Separated | 1.242 | 0.940 - 1.641 |  | 1.512 | 0.909 - 2.515 |  |
|  | Never Married | 1.135 | 0.959 - 1.344 |  | 1.227 | 0.826 - 1.825 |  |
|  | pcs\_score\_mother | 0.993\*\* | 0.986 - 1.000 |  | 0.999 | 0.984 - 1.014 |  |
|  | hous\_instab\_mother | 0.999 | 0.723 - 1.381 |  | 0.353\*\* | 0.150 - 0.827 |  |
|  | Constant | 0.270\*\*\* | 0.133 - 0.546 |  | 0.00428\*\*\* | 0.000842 - 0.0218 |  |
|  |  |  |  |  |  |  |  |
|  | Observations | 23,817 |  |  | 23,817 |  |  |

Figure 1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 3. Effect of Census Tract Poverty on Measures of Health Care Use and Child's Reported Health** | | | | | | | |
|  |  |  |  |  |  |  |  |
|  |  | (1) | | **(2)** | | **(3)** | |
| EQUATION | VARIABLES | OR | 95% CI | OR | 95% CI | OR | 95% CI |
| A. ER Visits |  |  |  |  |  |  |  |
|  | Quantile 1 |  |  |  |  |  |  |
|  | Quantile II | 1.235\*\* | 1.006 - 1.515 | 1.226\* | 0.994 - 1.511 | 1.141 | 0.930 - 1.401 |
|  | Quantile III | 1.230\* | 0.992 - 1.525 | 1.178 | 0.944 - 1.471 | 1.046 | 0.833 - 1.315 |
|  | Quantile IV | 1.417\*\*\* | 1.132 - 1.774 | 1.353\*\* | 1.061 - 1.724 | 1.190 | 0.928 - 1.526 |
|  | Quantile V | 1.406\*\*\* | 1.124 - 1.758 | 1.339\*\* | 1.044 - 1.718 | 1.114 | 0.865 - 1.433 |
|  |  |  |  |  |  |  |  |
| Controls |  | None |  | Child Characteristics | | Child Characteristics | |
|  |  |  |  |  |  | Mother Characteristics | |
| B. High Spending |  |  |  |  |  |  |  |
|  |  | OR | 95% CI | OR | 95% CI | OR | 95% CI |
|  | Quantile 1 |  |  |  |  |  |  |
|  | Quantile II | 0.697\*\*\* | 0.537 - 0.905 | 0.701\*\* | 0.526 - 0.933 | 0.778\* | 0.589 - 1.028 |
|  | Quantile III | 0.817 | 0.630 - 1.061 | 0.798 | 0.592 - 1.074 | 0.988 | 0.738 - 1.321 |
|  | Quantile IV | 0.630\*\*\* | 0.478 - 0.831 | 0.625\*\*\* | 0.453 - 0.862 | 0.799 | 0.580 - 1.101 |
|  | Quantile V | 0.690\*\* | 0.517 - 0.921 | 0.710\*\* | 0.523 - 0.963 | 1.015 | 0.734 - 1.405 |
| Controls |  | None |  | Child Characteristics | | Child Characteristics | |
|  |  |  |  |  |  | Mother Characteristics | |
| **C. Poor or Fair Reported Health** | | | | | | | |
|  |  | OR | 95% CI | OR | 95% CI | OR | 95% CI |
| FPL100 | Quantile 1 |  |  |  |  |  |  |
|  | Quantile II | 1.320\*\*\* | 1.075 - 1.621 | 1.289\*\* | 1.050 - 1.584 | 1.083 | 0.887 - 1.323 |
|  | Quantile III | 1.673\*\*\* | 1.353 - 2.068 | 1.588\*\*\* | 1.280 - 1.970 | 1.191 | 0.955 - 1.485 |
|  | Quantile IV | 2.105\*\*\* | 1.643 - 2.696 | 1.942\*\*\* | 1.523 - 2.475 | 1.358\*\* | 1.052 - 1.755 |
|  | Quantile V | 3.015\*\*\* | 2.272 - 4.002 | 2.576\*\*\* | 1.973 - 3.363 | 1.572\*\*\* | 1.199 - 2.061 |
| Controls |  | None |  | Child Characteristics | | Child Characteristics | |
|  |  |  |  |  |  | Mother Characteristics | |

**Discussion**

* Children are 1.7-2.5 times more likely to be considered super-utilizers of care if their mother is in the top 40% of health care expenditures or their father is in the top 25% of health care expenditures.
  + Thus, a child is up to 2.5 times more likely to be a super-utilizer if his or her parent is a super-utilizer.
* Children of parents, either mother or father, who have had at least 1 ER visit have 1.5 times the odds of an ER visit compared with those whose parents have not had an ER visit (p<0.01). This is more significant among low-income families (OR:1.7, p<0.01).



* Policy implications:
  + Family-focused policies may impact health and healthcare utilization for several end users of care
  + Improving mother’s health influences healthcare use for children
  + Family and community-focused policies are stronger when combined
  + Multiplying effects of an intervention

**Limitations**

* Self-reported health status – recall bias
* Diagnostic codes - measurement error and underrepresenting
* Social Deprivation Index – may mask variation and heterogeneity of smaller geographies than Census Tract
* However, strengths of the associations and nationally representative dataset

**Conclusions**

Our findings show correlates within families regarding healthcare utilization, patterns of seeking care, impact of parental health on child health and the impact of social determinants from both families and communities on health and healthcare.

Aiming toward family-focused heath outcomes also affirms the validity of two-generation policies and practices. We are poised to implement, study and scale programs that have demonstrated great promise and benefit to families and communities. Restructuring financial policies to provide scale and sustainability to family-focused interventions is dearly needed to set the trajectory for a healthier generation.