Delayed and forgone medical care are often used as outcomes of interest in health and population research as they are thought to adversely impact health status. Delayed and forgone care may exacerbate the severity of health problems or lead to the need for more complex treatment, which can reduce health status. Delayed treatment or forgone medical care mayresult in the increased use of health services at a later point in time, impacting health care expenditures (Chen, Rizzo & Rodriguez, 2011; Soumerai, 1994). However, few studies have empirically examined the relationship between unmet need and later health status.

To date, most studies have been descriptive in characterizing populations of children vulnerable to unmet needs (e.g., Newacheck et al., 2000; Kataoka, Zhang & Wells, 2002). For example, research has focused on unmet need for care among children with special health care needs or limitations (Newacheck, Rising & Kim, 2006; DeCesaro & Hemmeter, 2009) or children with mental health problems. Others have examined whether policy reduces unmet need (Lave et al., 1998; Feinberg et al., 2002; Jeffery & Newacheck, 2004). The only available study on the effects of unmet need on later health status examined adults 18 and over (Chen et al., 2011).

Unmet need and delayed care may result out of many reasons, some of which may be amenable to policy intervention. Factors such as cost and insurance coverage are often the target of social programs as these have shown to be significant barriers to care and reasons for unmet need. It is important to understand the potential impact of delayed and forgone care on health status if these measures are used to monitor the impact of the effects of social policies. It is also important to understand how unmet need is associated with later out-of-pocket burden, since individuals with lower incomes are more likely to delay or forgo care (Mayer, Skinner & Slikin, 2004). The implications of this study provide support for the continued use of these measures in research. Findings provide evidence to further explore the impact of unmet need on families, as unmet health care needs may place greater demands on family psychosocial and financial resources and reduce resources for other family members (Gordon, Rosenman, & Cuskelly, 2007;Kuhlthauand Perrin, 2001; Witt et al., 2011).

Drawing on Winship and Morgan's (1999) discussion of inference from observational data, we take advantage of multiple pre and post measures of self-rated health (SRH) over a three year period. We link data from two sources to create a panel data set with measures of SRH before and after we observe children's' unmet need. We construct a mean SRH from two observations before and two observations after the assessment of unmet need. By averaging scores, we are able to provide a more robust measure of SRH and better ascertain the persistence of any association of unmet need on SRH. We use unmet need as observed from one time point in our panel, as most studies that use unmet need as an outcome use cross-sectional surveys that inquire about unmet need at any time point in the past 12 months.

Data: This study uses data fromsources, the Integrated Health Interview Series (IHIS) and the Medical Expenditure Panel Survey (MEPS), to identify the population of interest. The IHIS was created from National Health Interview Survey (NHIS) data to facilitate analysis of the health of the U.S. population. The NHIS is a national representative sample of the U.S. civilian non-institutionalized population. However, use of the NHIS is discouraged by the changing sample designs, questionnaires, and variable coding schemes. The IHIS is a free online version of the NHIS that allows for customized, variable-based data set creation. The MEPS is a panel survey that begins a year after NHIS data collection and follows a sub-sample of NHIS respondents for two years, collecting data every four to five months, for a total of five rounds of data collection. It collects information at the person level on medical utilization, expenditures, demographic characteristics,

health factors, and economic status. Persons in the IHIS can be linked to the MEPS through publicly available link files. Children (age 17 and under) with unmet need are identified in round two of the MEPS and outcomes are assessed in rounds four and five of the MEPS. In both surveys, children do not respond to questions, rather adults who are knowledgeable about and responsible for the child's health answer questions for the child. We pool data from six MEPS panels (2003-2004 to 2008-2009) to gain sample size.

Time	Source	Measure	
Year 1	NHIS	SRH_PRE	
Year 2	MEPS R1	SRH_PRE	
Year 2	MEPS R2	Delayed/Unmet need, Expenditures	
Year 3	MEPS R3	SRH_POST, Expenditures	
Year 3	MEPS R4	SRH_POST, Expenditures	
Year 3	MEPS R5	SRH_POST, Expenditures	

Dependent variables: Self-rated health (SRH): This is assessed through a question which asks respondents to indicate if the child's health status is excellent, very good, good, fair, or poor. We average the score and recode this measure to a dichotomous variable indicating poor or fair health versus good or better health (Chen et al., 2011). Self-rated health is strongly linked to objective well-being, health expenditures, and has validity across socio-economic strata (Case, Fertig &Paxson, 2005; DeSalvo et al., 2009; Winter et al., 2007; Miller & Wolinsky, 2007). Self-rated mental health has been shown to be associated with functioning and psychosocial wellbeing (Fleishman & Zuvekas, 2007). For the "before" period, we average two observations of SRH, one from the IHIS and one from round one of them MEPS. For the "after" period, we use SRH from rounds three, four and five of the MEPS. (We are precluded from examining trends in the before period as this necessitates at least three data points).

Totalhealth expenditures at the end of year three: Respondents for the child are asked about the use of health services at each round. For each health service reported, respondents report the total amount paid and the amount paid from various sources, such as by an insurance plan or by the family. *Total expenditure* is the sum of expenses for prescription drug use, inpatient and outpatient visits, office based visits and emergency room visits. *Total out-of-pocket (OOP) expenditure*is the amount paid by the individual or family. We use the total expenditure at the end of year three, the year following the assessment delayed care and unmet need.

Independent variables: Delayed and unmet need for care: Respondents for sample children are asked:1) whether in the past 12 months there was any time they were delayed in getting medical or dental care or prescription medicines; and 2) whether in the past 12 months there was any time they were unable to get medical or dental care or prescription medicines. Respondents were then asked to indicate a reason and could select 1) could not afford care; 2) insurance would not pay; 3) the doctor refused the insurance plan; 4) problems getting to doctor's office; 5) different language; 6) could not get time off work; 7) did not know where to go; 8) was refused services; 9) could not get child care; 10) did not have time; 11) some other reason. From these indicators, we create three constructs: 1) any delayed care for any reason; 2) any unmet need for care for any reason; and 3) a global measure of any delayed or unmet medical care due to concerns about cost. We assess delayed and unmet need at round two of the MEPS (year two).

Additional covariates: We include individual and family-level variables that confound the relationship between of children's unmet need and outcomes. We include measures from the IHIS on whether the child has any unmet need or forgone care at baseline, whether the sample child has an

activity limitation and whether anyone in the family has any limitation, and whether the child or any family member has any chronic condition. We control for care-seeking tendencies by including measures of whether the child has special health care needs and for total and OOP spending during year two (measured contemporaneous with delayed and unmet need).

Age, race, education, marital status (of adult caretakers), insurance coverage and poverty status, family structure, and *family size*. Race is a self-reported indicator, and individuals were classified into non-Hispanic White, Hispanic, Black,or other. For *poverty status*, we use the IHIS imputed variables for the ratio of family income to federal poverty threshold provided by the IHIS. We follow IHIS guidelines and use each of the five imputed poverty variables using Stata's (version 12.0) *mi estimate* routine, which uses Rubin's combining rules for multiply imputed data (Rubin, 1996). *Insurance status* is categorized into private (any private coverage); public (Medicaid and other government programs),and uninsured. Insurance status refers to coverage at the time of the interview. Family structure indicates whether the household has one adult or two or more adults.

*Analysis:*We restrict our analyses to households with children under 18. We conduct analyses separately for 1) any delayed care for any reason; 2) unmet need; and 3); a global measure of any delayed or unmet medical care due to concerns about cost. We use Stata survey commands to adjust for the complex sampling design of the survey (unequal probability of selection and stratification). Panel dummies are included to control for panel-specific effects.

1) We begin by comparing the characteristics of children with delayed or unmet need for care to those without and calculating a propensity score for unmet or delayed care using a logit model. Children with and without unmet need may differ in characteristics that also influence the outcome (SRH and expenditures) and confound analytical findings. The effect of interest, unmet need, is only generalizable to children who would ever be at risk for unmet need. To achieve a balance of confounders between these groups, we match cases (delayed or unmet need) to controls, following the methodology of Rosenbaum and Rubin (1983) and conduct analyses on the matched sample.

2) Within our matched sample, we then use logistic regression analyses to determine the relationship between our three independent variables and poor health status, adjusting for baseline SRH, unmet need and other covariates. The effect of each independent variable on medical expenditures is estimated by examining the average difference in expenditures between case/control pairs.

3) Finally, we calculate OOP expenditures as percent of family income for families with and without children with delayed care to understand the impact of health care costs.

Results: Preliminary results indicate that delayed and unmet need for care during year two were not associated with reductions in self-rated health during year three. Delayed care was associated with greater total and out-of-pocket spending in year three. Foregone care was not associated with any greater spending the following year, which suggests possible continued cost barriers to care. We plan to present final results from the matched analyses at the PAA conference next spring.

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