HAVING A USUAL SOURCE OF CARE: DOES IMPACT VARY BY CHILD'S HEALTH
CONDITION?

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Chapter 1: Study Importance and Background

I. Priority Placed on Having a Usual Source of Care

When children have *a usual source of care*, it means they have a usual place, or person, they go to when they are sick or need advice on their health.[1] Having such a provider is widely recommended for children and monitored by government agencies and professional organizations because having a usual source of care is thought to indicate better access to, or greater continuity of, medical care.[2-5]

Table 1.1 lists several of the current recommendations by national associations and DHHS for children having a usual source of care. The table shows these recommendations vary somewhat according to the degree to which they specify the characteristics of services delivered. Specifically, two of the recommendations recommend an ongoing source of care, while the other two recommendations indicate the usual source of care should be a *medical home*.

Table 1.1 Recommendations for Having a Usual Source of Care Among Children

Agency/Organization	Recommendation
US Department of Health and Human Services[2]	Increase the proportion of persons who have a specific source of ongoing care. For children ages 0-17, the 2010 target is 97 percent.
The Administration for Children and Families[3]	Each child should have an ongoing source of continuous, accessible health care.
American Academy of Pediatrics[4]	Physicians should strive to attain a medical home for every child in their community. Care within a medical home is delivered or directed by well-trained physicians who provide primary care and is "continuous, accessible, comprehensive, coordinated, compassionate, family-centered, and culturally effective."
American Academy of Family Physicians[5]	Ensure every American has a personal medical home, where care is "continuous, accessible, accountable, comprehensive, integrated, patient-centered, safe, scientifically valid, and satisfying."

A medical home typically refers to a more specific type of a usual source of care that is "continuous, accessible, comprehensive, coordinated, compassionate, family-centered, and culturally effective."[4] The concept of a medical home was initially developed in the early 1980's for children with special health care needs, but more recent efforts are attempting to provide this form of care to all children.[6,7] The concept of the medical home is still relatively new, and it is difficult to measure all the characteristics

specified.[8,9,10] Therefore, this study examines the broader recommendation of having a usual source of care, which includes medical homes.

The importance placed on these recommendations can be shown by the number of national health reports that annually track the proportion of children who have a usual source of care, including Health U.S, the National Healthcare and Quality Report, and the National Survey of Children's Health.[11-13]

The importance of these recommendations is also demonstrated by the number of policies and amount of resources that have been targeted to ensuring children have a usual source of care. For example, between January 1, 2005 and December 31, 2007, fifteen states[1] enacted legislation to establish or encourage the establishment of medical homes as an ongoing source of health care for children.[14] Some of these medical home initiatives target children with special health care needs while others target all children.

In addition, from March 31, 2001 to June 30, 2008, the US Department of Health and Human Service's Maternal and Child Health Bureau awarded fifteen states Statewide Medical Home Development grants for up to $300,000 to promote access to ongoing comprehensive care though a medical home for children with special health care needs.[15] Similarly, the American Academy of Pediatrics now awards CATCH Medical Home planning grants for up to $10,000 to pediatricians who develop initiatives that increase all children's access to medical homes.[16]

II. Better Research is Needed

With an increasing number of policies and resources aimed at ensuring children have a usual source of care, an accurate and complete assessment of the impact of having a usual source of care would assure that these resources are wisely spent. Previous research studies (detailed in Chapter 2) suggest having a usual source of care is related to more appropriate medical care utilization, such as greater ambulatory care utilization and less use of emergency rooms. However, limitations across these studies prompt reservations about the accuracy of their findings and limit researchers' abilities to establish causality. Furthermore, research has yet to determine whether the impact of having a usual source of care varies according to the child's health condition.

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[1] California, Connecticut, Florida, Idaho, Iowa, Louisiana, Maryland, Mississippi, Rhode Island, Texas, Washington, and W Virginia.

This study fulfills this knowledge gap by addressing the limitations of previous studies and examining whether the uniform recommendation for children having a usual source of care affects children's medical care utilization in the same way, regardless of their health condition.

A. Specific Aims

Specifically, this study aims to provide a better understanding of how having a usual source of care affects medical care utilization when children acquire different types of health conditions while addressing the following previous study limitations:

- Uncertainty around the findings due to reverse causality, which is when the relationship between the explanatory and dependent variables can occur in both directions,

- Biased findings due to selection bias, or an unmeasured variable being related to having a usual source of care as well as the outcome examined,

- Imprecise definitions of a usual source of care that may inappropriately include use of emergency room care,

- Not controlling for all known confounding variables, and

- Not assessing if the effects vary according to the child's health condition.

This study reduces uncertainty around reverse causality by utilizing a panel dataset, which allows the presence of a usual source of care to be established prior to the child acquiring a specific health condition and subsequently using medical care. It also addresses selection bias by including an instrumental variable in the multivariate analyses. Additionally, the study takes advantage of the extensive information available in the dataset to clearly exclude emergency rooms as usual source of care and control for potential confounding variables. Finally, the study capitalizes on the dataset's condition-specific information by conducting separate analyses for ten of the most common acute and chronic child conditions, achieving a level of comparability among study groups that has not been achieved in previous studies.

B. Conceptual Model

The conceptual model (Figure 1.1) depicts how a usual source of care is expected to have an impact on medical care utilization for children when they acquire, or have an episode of, one of ten selected common childhood conditions.

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The model begins with several predisposing, enabling, and need characteristics that affect whether or not children have a usual source of care prior to acquiring the condition initially conceptualized by Andersen et al.[17-19] Characteristics of the child need to be distinguished from those of the illness. Different types of illnesses can affect children with predisposing characteristics differently. Examples of these characteristics include age, race/ethnicity (predisposing), income insurance (enabling), and health status (need).[17-19] Predisposing, enabling, and need characteristics may directly influence whether the child has a usual source of care, as well as their medical care utilization, including ambulatory care and utilization of hospital and emergency room care services (evidence is detailed in Chapter 2.I.A).

Figure 1.1: Children acquiring one of ten common conditions
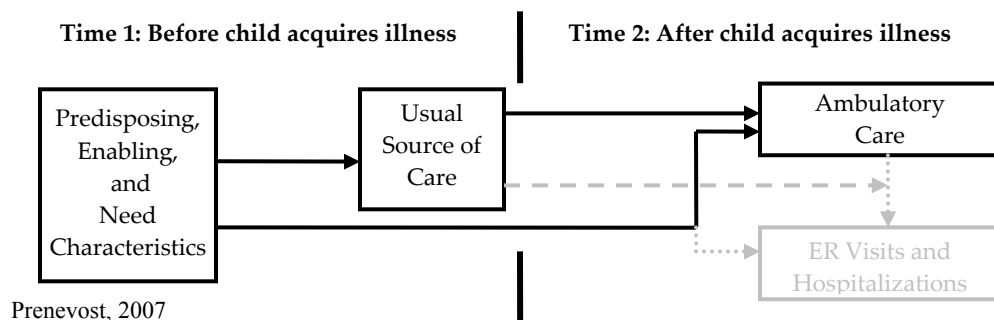
The manner in which the conceptual model proceeds depends on whether the condition is one of three types: 1) an acute condition not sensitive to ambulatory care, 2) an ambulatory care sensitive condition, or a condition that is sensitive to ambulatory care, such that a lack of treatment or timely treatment exacerbates the condition, or 3) a chronic condition that necessitates ongoing medication or medical treatment.

When children acquire conditions that *are not* sensitive to ambulatory care, the impact of having a usual source of care is limited to the mechanism illustrated by the plain arrows. For these conditions, having a usual source of care denotes access to ambulatory care and results in a greater likelihood to make outpatient or office-based visits. Because these conditions often improve without any care, this access to ambulatory care does not affect the child's likelihood of using the emergency room or

hospital for their initial source of care or for subsequent care due to the condition worsening.

When children have or acquire ambulatory care sensitive conditions, the mechanism illustrated by the dotted lines becomes important (Figure 1.2). Again, having a usual source of care denotes access to ambulatory care and results in a greater likelihood to make outpatient or office-based visits. However, for these conditions, utilizing ambulatory care should translate into reductions in emergency room use and hospitalizations by reducing the number of children using these sites as their initial source of care as well as the number of children needing subsequent care at these sites as a result of their condition worsening.

Figure 1.2: Children who acquire a condition that is sensitive to ambulatory care

Time 1: Before child acquires illness | Time 2: After child acquires illness

Predisposing, Enabling, and Need Characteristics → Usual Source of Care → Ambulatory Care → ER Visits and Hospitalizations

Prenevost, 2007
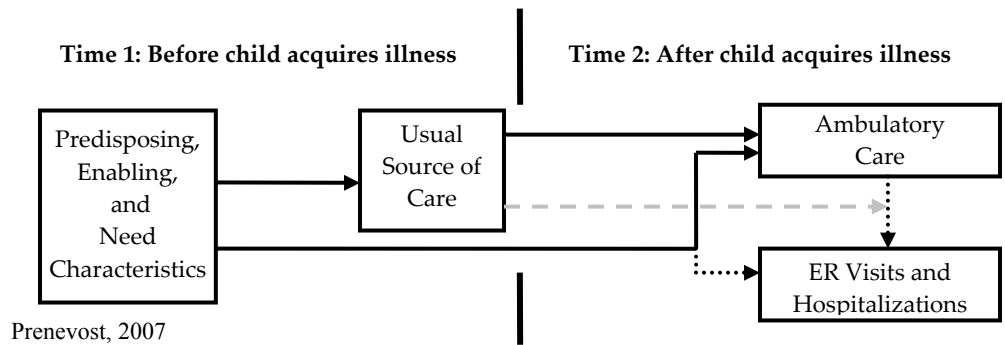
When children have an episode of a chronic condition the mechanism illustrated by the dashed line becomes the focus (Figure 1.3). The dashed line denotes the effect from a potential degree of continuity provided by the usual source of care during the ambulatory care visit.

Figure 1.3: Children who have a chronic condition
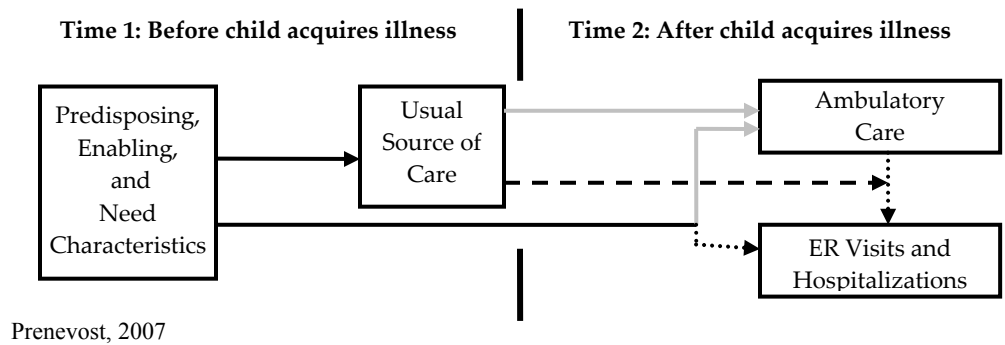
Time 1: Before child acquires illness | Time 2: After child acquires illness

Predisposing, Enabling, and Need Characteristics → Usual Source of Care → Ambulatory Care → ER Visits and Hospitalizations

Prenevost, 2007

Continuity of care is related to improved provider-patient communication, care coordination, and trust, which are linked to improved treatment adherence, fewer delays in care and unmet needs, and more optimal care overall. The conceptual model contends that for children who have conditions requiring long-term, ongoing medical treatment and obtain ambulatory care, having a usual source of care should translate into fewer emergency room visits and hospitalizations.

C. Hypotheses

The following hypotheses are tested to confirm the manner in which having a usual source of care affects medical care utilization among children having different kinds of health conditions.

1. Having a usual source of care increases the likelihood of utilizing ambulatory care when a child acquires, or has an episode of, any of the study conditions.

2. Having a usual source of care decreases the likelihood of an emergency room visit and hospitalization when a child acquires an ambulatory sensitive condition.

3. Having a usual source of care decreases the likelihood of an emergency room visit and hospitalization for children who have an episode of a chronic condition and obtain ambulatory care.

Although the hypotheses are sometimes limited to only select condition types, in order to truly understand the impact of having a usual source of care, it is important to examine the effect of having a usual source of care across all of the outcome measures for each condition type.

Because of limitations in the data used, the study cannot accurately determine the temporality of care. For example, because the study data lacks dates of service for care, it is possible that children could visit the ER/hospital first and then receive follow-up care with an ambulatory care provider. However, by examining the effect of having a usual source of care across all outcomes by condition type, it is thought that the differences in the patterns of care can help produce a clearer picture of how having a usual source of care impacts medical care utilization.

Table 1.2 shows the expected coefficients for having a usual source of care on the study outcomes by condition type. As hypothesis #1 states that having a usual source of

care is expected to increase the likelihood of utilizing ambulatory care for all condition types, which would indicate having usual source of care denotes access to care.

Table 1.2 Expected Coefficients for Having a Usual Source of Care on Each Outcome

Condition Type	Ambulatory Care	ER/Hospital Care	ER/Hospital Care Among those using Ambulatory Care
Acute conditions not sensitive to ambulatory care	+	Not significant	Not significant
Ambulatory care sensitive conditions	+	-	Not significant
Chronic conditions	+	Not significant	-

The patterns of care differ for the other two outcome measures across the condition types. The coefficient for having a usual source of care on ER/Hospital care is only expected to be negative for the ambulatory care sensitive conditions because these are the conditions that should be affected by having access (evidence is detailed in Chapter 2.I.C). The coefficient for having a usual source of care on ER/Hospital care among children who use ambulatory care is only expected to be negative for chronic conditions because these are the conditions that should be affected by having a greater degree of continuity (evidence is detailed in Chapter 2.I.D).

D. Policy and Practice Implications

With an increasing number of policies and resources aimed at ensuring children have a usual source of care, this study fulfills an important need of providing a more accurate and complete assessment of whether having a usual source of care causes the apparent beneficial differences in medical care utilization and whether a one-size-fits all approach is the most effective solution for children, regardless of their health status.

The knowledge provided by this study will allow policymakers to refine, or feel more confident in, their recommendations regarding children having a usual source of care. The information will also allow program administrators to allocate their resources to address this issue in the most effective manner, and it will enable researchers to more effectively collect, monitor, and analyze data regarding children and whether they have a usual source of care.

Chapter 2: Literature Review

This chapter reviews the literature used to establish the study's importance, develop the conceptual model, and make the methodological decisions required to complete this study.

I. Establishing the Study's Importance

While having a usual source of care for children is widely recommended, monitored, and studied, clearly understanding why having a usual source or care is important has been hindered by inadequate research designs and study limitations.

Table 2.1 provides information on previous studies examining the relationship between having a usual source of care and medical care utilization, including doctor visits, emergency room visits, and hospitalizations, among children. Common limitations among these studies include failing to address the issues of selection bias and reverse causality, using imprecise definitions of usual source of care, and neglecting important confounding variables in analyses. The following describes each of these issues, how the issue is dealt with in previous studies, and how this study addresses the issue.

Table 2.1: Previous Studies of USC and Doctor Visits, ER Visits, and Hospitalizations

Citation	Study Population	Accounts for Endogeneity	USC definition	Includes Key Variables	Study Findings
Aday et al. 1993[20]	CSHCN 0-18 in the 1988 NHIS	No: uses ordinary logistic regression.	Regular medical provider vs. no regular provider. Includes ER?	Yes	Children who have a USC are more likely to make doctor visits, but are not less likely to have hospitalizations.
Andersen et al. 2002[21]	Poor children 0-17 in the 1995-96 NHIS.	No: Uses ordinary logistic regression.	No regular source vs. regular source. Includes ER.?	Yes	Children who have a USC are more likely to make doctor visits.
Bartman et al. 1997[22]	Teens 11-17 in the1987 MEPS	No: Uses ordinary logistic regression.	A particular clinic, doctor office, or other place the child usually goes if needs advice on health. Includes ER?	Yes	Children who lack a USC are less likely to make doctor visits but are not more likely to make ER visits.
Brousseau et al. 2004[23]	Children 0-18 in an HMO plan making 3+visits.	Uses visits prior to ER or hospital; does not address selection bias.	Index factors in the # of visits, # to one provider, and # of providers seen. ER is excluded.	Omits race/ ethnicity.	Children who have a regular provider are less likely to make ER visits

Citation	Study Population	Accounts for Endogeneity	USC definition	Includes Key Variables	Study Findings
Christakis et al. 2001[24]	Children 0-17 in an HMO making 4+ visits.	Uses visits prior to ER or hospital; does not address selection bias.	Index factors in the # of visits, # to one provider, and # of providers seen. ER is excluded.	Omits race/ ethnicity and family income	Children who have a regular provider are less likely to make ER visits and have hospitalizations.
Chistakis et al. 1999[25]	Children 0-19 on Medicaid making 4+ visits	Uses visits prior to ER or hospital; does not address selection bias.	Index factors in the # of visits, # to one provider, and # of providers seen. ER is excluded.	Omits race/ ethnicity and family income	Children who have a regular provider are less likely to make ER visits.
Dovey, et al 2003[26]	Children 0-17 in the 1996 MEPS	No: Uses ordinary logistic regression	A particular clinic, office, or other place child usually goes if needs advice on health. Includes ER?	Omits health status	Children lacking a USC are less likely to make doctor visits and more likely to make ER visits and hospitalizations.
Jones et al. 1999[27]	Children 0-15 using an ED at an urban public hospital	Measures USC status prior to ER visit, but does not address selection bias.	A "physician or clinic where they receive routine care." ER is excluded	Omits race/ ethnicity and family income	Children who lack a USC are more likely to make ER visits for non-urgent conditions.
Kasper et al. 1987[28]	Children 0-17 in the 1980 MEPS	No: Uses ordinary logistic regression	Whether the child has a usual source of care and whether a specific provider is seen. ER is excluded	Omits health status	Children who lack a USC are less likely to make doctor visits.
Kieckhefer et al. 2005[29]	Asthmatic Children 0-17 in the 1996-2000 MEPS	No: Uses ordinary logistic regression	The child has at least an 8 on a 10-item medical home index. ER is excluded	Yes	Identification of a USC was not significantly related to asthma-related ED use.
Ryan et al. 2001[30]	Adolescents 10-18 from four schools in western Maryland	No: Uses ordinary logistic regression	They have one place where they usually went for regular medical care. ER is excluded	Omits insurance	Adolescents who lack a USC are not less likely to make ER visits.

USC=usual source of care, MEPS=Medical Expenditure Panel Survey, NHIS=National Health Interview Survey, CSHCN=children with special health care needs.

A. Selection Bias

Previous studies among children use observational study designs, for which assignment to the intervention group is non-random and the potential for selection bias is great. Selection bias, or omitted variable bias, occurs when there is one or more

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unmeasured variables related to being in the treatment group as well as the outcome being measured. For example, the severity of a person's health condition may affect the likelihood that person has a usual source of care as well as their likelihood of seeking care. When selection bias exists, estimates of the relationship between being in the treatment group and the studied outcome are biased.

A 2002 article by Xu summarizes several research studies documenting this issue and then provides a framework for accounting for selection bias when examining the relationship between having a usual source of care and obtaining care.[31] Figure 2.1 illustrates how accounting for selection bias changes the conceptual model, showing that the unobserved characteristics are related to being in the treatment group (having a usual source of care) as well as the outcomes being measured.

Figure 2.1: Conceptual model, adjusting for selection bias

Prenevost, 2007
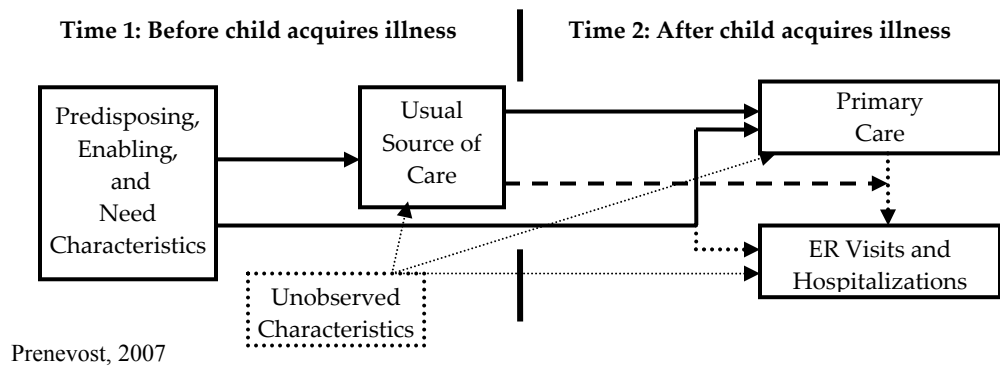
None of the previous studies examining the relationship between having usual source of care and doctor visits, emergency room visits, and hospitalizations accounts for the issue of selection bias. And, a study examining receipt of preventive care among women and children finds the significant relationship between having a usual source of care and obtaining preventive care disappears among children when the unobservable measures are taken into account.[32]

This study addresses the issue of selection bias by using an instrumental variable, which allows the study to adjust for the effects from unobservable measures that are related to choosing to have a usual source of care.

B. Reverse Causality

Nearly all of the previous studies analyze cross-sectional data, for which it is difficult to rule out the possibility of reverse causality. Reverse causality exists when the relationship between explanatory and dependent variables can be explained in either direction. For example, when a positive correlation between using medical care and having a usual source of care is observed, we do not know whether it is because people using more care acquire a usual source of care, or if having a usual source of care results in better access and greater utilization.

A 1985 article by Kuder and Levitz illustrates the importance of this issue in comparing results from analyses conducted with and without sophisticated modeling techniques that address the two-directional relationship. Their research found that the impact of having a usual source of care is four times greater when the analyses ignore the two-directional relationship.[33]

Prior studies among children using cross-sectional data have typically not used any sophisticated modeling techniques that would allow them to address reverse causality. A few studies have addressed the issue of reverse causality by analyzing panel data, which allows the researchers to illustrate temporal relationships between having a usual source of care and medical care utilization. However, these studies all rely on claims data and the study populations are limited to children who make at least three doctor visits, which significantly limits the generalizability of their findings to uninsured children and children who do not make three doctor visits in one year.[23-25]

This study addresses reverse causality by analyzing panel data to establish the temporal relationship between having usual source of care and medical care utilization.[2] In addition, this study includes uninsured children and children who do not use medical care in the study population, so the findings are more generalizable.

C. Clearly Defining Usual Source of Care

How a usual source of care is defined is very important because it affects the proportion of children having a usual source of care and the resulting associations. For example, having emergency rooms included in the definition of a usual source of care can

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[2] The second round is the first time MEPS asks questions regarding a usual source of care. Medical care utilization is examined during rounds 3 through 5.

be a significant problem when emergency room visits are also examined as an outcome, and it can also affect other study outcomes when emergency rooms provide fundamentally different services than other usual sources of care.[34]

In addition, the method used to determine whether the child has a usual source of care can also impact the results. Generally, there are two methods for which the presence of a usual source of care can be determined. The first is by using claims data to deduce the presence of a usual source of care according to from whom and where the child receives care. The second is by using survey data and establishing the presence of a usual source of care according to the individual's perception as indicated by self-report. While the latter definition is limited by potential inaccuracy of self-report, the former version generally relies on insurance claims data, so it excludes children who do not, or can not, obtain care and greatly limits the generalizability of the research findings.

Several previous studies enumerated in Table 2.1 do not specify whether or not a usual source of care includes an emergency room,[20-22,26] and two of these examine emergency room visits as an outcome. In addition, three studies use claims data to deduce the presence of a usual source of care, so their findings are relevant only to children who access care.[23-25]

To address these issues, the current study examines having a usual source of care from the individual's perspective, so it can include children who do not use care. In addition, the study excludes emergency rooms from the definition of having a usual source of care.

D. Confounding Variables

Neglecting characteristics shown to be related to having a usual source of care can also bias the study results. Section II.A of this chapter details studies examining characteristics associated with having a usual source of care and finds several variables, including race/ethnicity, insurance status, family income, and health status have repeatedly been shown to be related to a child having a usual source of care and using medical care. These characteristics need to be accounted for in studies examining the effect of having a usual source of care on medical care utilization. Other variables, such

as citizenship, language, and parental education have less evidence, but need to be tested to confirm whether it is appropriate or not to include them in the analytical model.

Several previous studies are forced to exclude confounding variables that have been repeatedly shown to be significantly related to having a usual source of care because of data limitations. Specifically, four do not account for race/ethnicity,[23-25,27] three do not account for family income,[24,25,27] two do not account for health status,[26,28] and one does not account for insurance status.[30]

The current study uses a data set that allows the inclusion of all confounding variables shown to be related to having a usual source of care and accounts for those shown to be significant. Additionally, by comparing utilization according to specific conditions and illnesses, the current study achieves a level of equivalence in health status that has never been approached.

II. Developing the Conceptual Model

Findings from numerous studies were used to develop of the conceptual model. The following separates the conceptual model by its principal assumptions and details the relevant evidence supporting each supposition.

A. Predisposing, Enabling, and Need Characteristics

The conceptual model begins with the factors theorized to influence medical care utilization in the *Behavioral Model of Health Services Use*.[17] These factors include predisposing, enabling, and need characteristics. Predisposing characteristics are those that "exist prior to the onset of specific episodes of illness," and "are not directly responsible for health [care] use," such as age, sex, and race/ethnicity.[17-19]

Enabling characteristics represent individual, family, and community characteristics that facilitate the use of medical care, such as family income and insurance status.[17-19] Need characteristics represent the individuals perceived and evaluated level of illness.[17-19] In addition to influencing medical care utilization, several of these characteristics have also been associated with children having a usual source of care.

Table 2.2: Characteristics Associated with Children Using Health Care and Having a Usual Source of Care

Citation	Source	Multivariate Findings	R/E	Ins	Inc	Hlth	Oth
Chen, Escarce. 2006[35]	96-01 MEPS	Children who are White, living in families making 300% FPL or more, insured, and have parents without HS degree are more likely to use health care.	X	X	X		X
Dunderstadt, et al. 2006[36]	2003 NHIS	Among poor children, uninsured children are more likely to more lack a USC and not use health care than children who had full-year private coverage.		X			
Guendelman. 2001[37]	1997 NHIS	Compared to children in moderate to affluent families, children of the working poor were less likely to have a USC.			X		
Huang et al. 2006[38]	1999 NSAF	Children who are non-citizens, Hispanic, in families making less than 300% FPL, have parents without a HS degree, or uninsured are more likely to lack a USC and less likely to use health care. Children in fair/poor health are more likely to use health care.	X	X	X	X	X
Kogan et al. 2006[39]	1991 NMIHS	Children with gaps in insurance of 6 months or more or who do not have chronic conditions are more likely to lack a USC.		X		X	
Lieu et al. 1993[40]	1988 NHIS	Black and Hispanic adolescents were more likely to lack a usual source of routine care than White adolescents.	X				
Mulvihill et al. 2007[41]		Children who are uninsured, black, living near the FPL, have parents without HS degree, or have less than good health are less likely to have a USC.	X	X	X	X	X
Newacheck et al. 1999[42]	1995 NHIS	Uninsured adolescents are more likely than insured adolescents to lack a USC.		X			
Newacheck et al. 1996[43]	1987 MEPS	Children who are White or insured are more likely to have a USC.	X	X			
Newacheck et al. 2002[44]	1995 NHIS	Among CSHCN, Hispanic children are more likely than Whites to lack a USC.	X				
Newacheck et al. 2000[45]	1995 NHIS	Among CSHCN, uninsured children are more likely than insured to lack a USC.		X			
Newacheck et al. 1998[46]	1995 NHIS	Among poor children, those with Medicaid are more likely to have a USC than uninsured		X			
Newacheck et al. 1998[47]	1994 NHIS	Uninsured children are more likely to lack a USC than insured children.		X			
Newacheck et al. 2003[48]	99-00 NHIS	Among adolescents, those living near the FPL are less likely to have a USC.			X		
Selden, Hudson. 2006[49]	96-02 MEPS	Insured children are less likely than uninsured children to lack a USC.		X			
Shi, Stevens. 2005[50]	2000 MEPS	Asian, Hispanic, or Black children are more likely to lack a USC and less likely to use health care than White children.	X				
Silver, Stein. 2001[51]	1994 NHIS	Children with chronic conditions were more likely to have a USC.				X	
Stevens et al. 2006[52]	2001 CHIS	Children who are in families making less than 200% FPL, are uninsured, or had parents speaking a non-English language are less likely to have a USC		X	X		X
Weinick, Krauss. 2000[53]	1996 MEPS	Black and Hispanic children are less likely than White children to have a USC.	X				
Yu et al. 2006[54]	2001 CHIS	Children who are not citizens or who are uninsured are more likely to lack a USC.		X			X
Total			8	13	6	4	5

USC=usual source of care, R/E=race/ethnicity, Ins=insurance status, Inc=family income, FPL-federal poverty level, Hlth=health status, Oth=other, NHIS=National Health Interview Survey, NSAF=National Survey of America's Families, NMISH=National Maternal and Infant Health Survey, MEPS=Medical Expenditure Panel Survey, CHIS=California Health Interview Survey, CSHCN=children with special health care needs.

Table 2.2 shows several characteristics, such as race/ethnicity, insurance, family income, and health status have been repeatedly shown to be related to a child having a usual source of care and using medical care services, while other variables, such as citizenship, language, and parental education have less evidence. To account for these characteristics, the conceptual model (Figure 2.2) includes pathways for predisposing, enabling, and need characteristics to affect both utilization and having a usual source of care, and the analytical models include these variables when testing each hypothesis.

Figure 2.2: Predisposing, enabling, and need affects utilization and having a USC

Time 1: Before child acquires illness   **Time 2: After child acquires illness**

Predisposing, Enabling, and Need Characteristics → Usual Source of Care → Primary Care

ER Visits and Hospitalizations

Prenevost, 2007
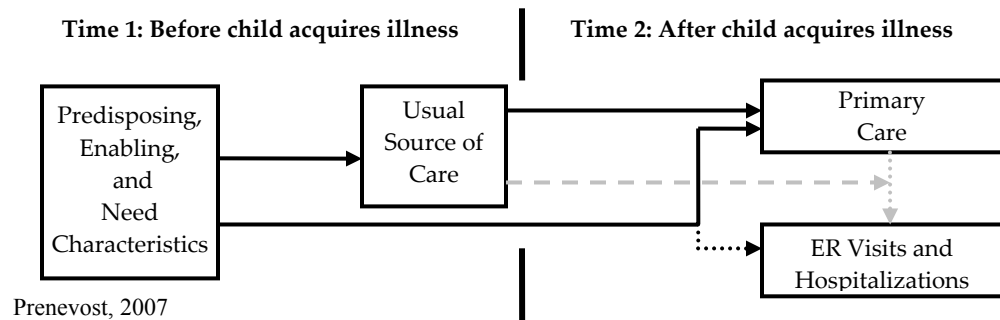
B. Having a Usual Source of Care Increases Utilization of Ambulatory care

The hypothesis that having a usual source of care is associated with increased access and utilization of ambulatory care is a key element of the conceptual model. All of the studies listed in Table 2.2 use whether or not the child has a usual source of care as a measure of access. Specifically, Dunderstadt states, "Access to health care [is] indicated by…the absence of a usual source of care,"[36] Huang asserts, "Health care access [is] based on…whether the child had a usual source of care other than the emergency room,"[38] and Shi contends that lacking a usual source of care represents "a negative dimension of access to care."[50] However, none of these studies test whether having a usual source of care, which is really a measure of *potential* access, translates into *realized access*, or actual medical care utilization, which several researchers distinguish as the real "proof" of access.[55-57]

A couple of articles have examined the relationship between having a usual source of care and proxies of unrealized access, such as whether the child has unmet health care needs or has delayed seeking needed care. Specifically, Newacheck et al. examines data for children from the 1993-96 NHIS and found significant associations

between lacking a usual source of care and having an unmet medical need, an unmet medication need, an unmet dental need, and an unmet vision need.[58] In addition, Strickland et al. examines data from the 2001 National Survey of Children with Special Health Care needs and found that children who lack a usual source of care were more likely to have an unmet health care need and have delayed or forgone care.[59]

However, similar to the studies listed in Table 2.1, which examine the relationship between having a usual source of care and medical care utilization, the Newacheck and Strickland studies are hindered by their study designs. The failure to address reverse causality and selection bias impede their ability to go beyond identifying associations between having a usual source of care and an unmet need or delayed care and truly demonstrate causality.

The conceptual model for this study is designed to test the widely held belief, and the previously reported associations suggesting, a usual source of care indicates the child has greater access to medical care. The conceptual model contends this access is realized in the form of ambulatory care, which is defined as an outpatient or office-based visit (Figure 2.3).

Figure 2.3: Having a USC increases utilization of ambulatory care

Prenevost, 2007
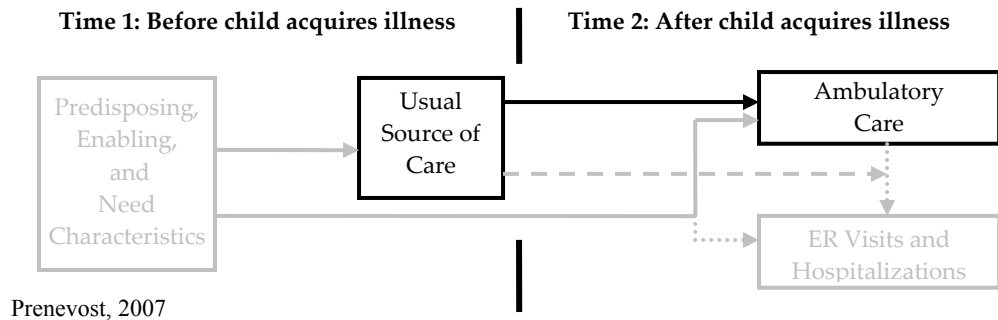
C. A Usual Source of Care Decreases ER and Hospital Visits for ACS Conditions

Ambulatory Care Sensitive (ACS) conditions are conditions for which effective and timely ambulatory care can help to reduce the risk for emergency room visits and hospitalizations.[56,60] ACS conditions studied among children include anemia, asthma, bronchitis, cellulitis, dehydration, diabetes, epilepsy, gastroenteritis, pneumonia, severe ear, nose, and throat infections, and kidney or urinary tract infections.[61-65]

The Institute of Medicine endorses using ACS conditions as an evaluation tool,[66] and a variety of studies have used ACS hospitalizations and emergency room visits to identify barriers in access to, and assess the quality of, ambulatory care (Table 2.3). Previous studies have found expanding insurance coverage, increasing HMO penetration, and greater availability of primary care physicians are associated with lower ACS condition hospitalizations and emergency room visit rates. The studies suggest that these findings are a result of the availability of primary care, which in turn results in more effective and timely ambulatory care and reduces the need of subsequent emergency care or hospitalizations because of conditions worsening.[61,62,64,71]

Table 2.3: Using ACS Condition Hospital and ER Visits to Measure Access and Quality

Citation	Description
Bermudez, Baker. 2005[61]	Examines ACS hospitalizations per 100,000 children across California counties from 1996 to 2000 to assess changes in access resulting from SCHIP.
Billings et al. 1996[67]	Examines changes in ACS discharges in New York City from 1982-1993 to evaluate changes in the city's health care delivery system.
Bindman et al. 2005[68]	Uses ACS hospitalizations to compare mandatory managed care to fee-for-service plans among California Medicaid enrollees from 1994 to 1999.
Epstein. 2001[69]	Analyzes rates of ACS hospitalizations across Virginia counties from 1995-1997 to evaluate the effect of public clinics on low-income populations.
Falik et al. 2001[60]	Uses ACS hospitalizations and ACS emergency room visits to compare FQHCs to other providers serving Medicaid enrollees in five states.
Falik et al. 2006[70]	Uses ACS hospitalizations and emergency room visits to assess the performance across Medicaid primary care providers in four states.
Friedman, Basu. 2001[62]	Examines ACS admissions per 1,000 children in New York to assess effects from greater HMO penetration and primary care physician availability.
Gadomski et al. 1998[64]	Examines ACS condition hospitalizations among Medicaid enrollees ages 0-18 to evaluate a programs that assigns a primary care provider.
Kaestner et al. 2001[71]	Analyzes ACS hospitalization rates among children ages 2-9 living in low-incomes families to evaluate effects from Medicaid expansions from 1988 to 1992.
Zhan et al. 2004[72]	Uses ACS hospitalizations to assess effect of HMO penetration in 22 states in 1998.
Zwang et al. 2006[73]	Uses rates of ACS hospitalizations across Nebraska counties from 1999-2001 to evaluate the effect of rural health clinics on rural populations.

When studying ACS conditions it is important to consider confounding variables because previous studies have found several individual and family characteristics are also associated with ACS condition medical care utilization. These studies find higher hospitalization and emergency room visit rates are associated with younger age, minority race, lacking insurance, lower family income, and living in a rural area.[65,74,75]

The current conceptual model incorporates the findings from previous studies and accounts for the predisposing and enabling characteristics associated with ACS condition

medical care. The conceptual mode then (Figure 2.4) suggests that when a child has a usual source of care when s/he acquires an ACS condition, the child is less likely to have an emergency room visit or hospitalization because the child is less likely to use these sites as their initial source of care as well as less likely to need subsequent care at these sites as a result of their condition worsening.

Figure 2.4: Ambulatory care translates into fewer ER and hospital visits for ACS conditions

Prenevost, 2007
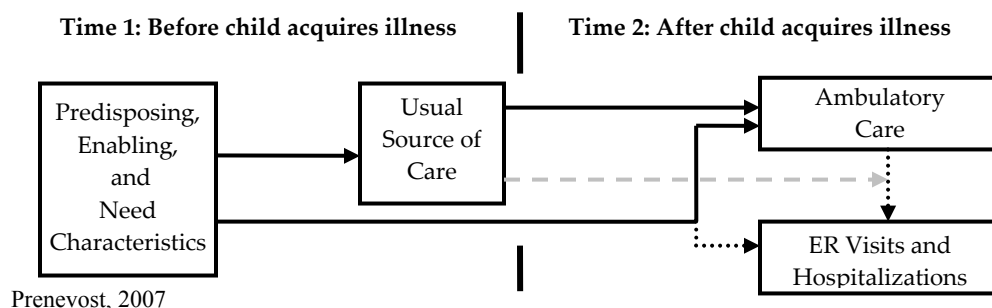
D. A Usual Source of Care Reduces ER and Hospital Visits for Chronic Conditions

In addition to access, having a usual source of care also denotes an increased level of provider continuity. Provider continuity has been associated with several benefits. Specifically, several studies have found continuity of care is related to improved provider-patient communication, care coordination, and trust (Table 2.4). Other studies have then linked these characteristics to improved treatment adherence, fewer delays in care and unmet need, and more optimal care overall.

Table 2.4: Effects of Provider Continuity

Citation	Population	Multivariate Findings	Outcome
Christakis et al. 2002[76]	N=759, UofWA clinic, ages 0-18	Greater provider continuity, measured by a continuity of care index, is associated with greater CAHPS ratings for "explaining things in a way [the parent] could understand."	Comm.
Christakis et al. 2003[77]	N=759, UofWA clinic, ages 0-18	Greater provider continuity, measured using a continuity of care index, is associated with greater parental care coordination, measured by, knowing about other care the child receives, communicating with the other health care providers, and following up problems.	Coord.
Flocke. 1997[78]	N=1,839, Ohio clinics, all ages	Forced discontinuity, when patients are forced to change doctors due to changes in insurance plans, is associated lower reports of feeling comfortable asking the doctor questions, receiving explanations, and being listened to by the doctor.	Comm
Love et al. 2000[79]	N=1,726, KY Medicaid adults	Greater provider continuity, or seeing the same doctor, is associated with a greater likelihood that the doctor "listened and talked about [the individual's] care."	Comm

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Citation	Population	Multivariate Findings	Outcome
Mainouss et al. 2001[80]	N=418, 2 SC/3 KY general practices.	Greater provider continuity, or the length of time of the relationship with the regular provider, was associated with greater trust in the physician, measured by the *Trust in Physician Scale*	Trust
Parchman et al. 2004[81]	1993 Medicare Ben Survey	Greater provider continuity, or the length of time the individual has seen their usual doctor, is associated greater scores on a 3-item communication scale and a 4-item trust scale.	Comm and Trust
Seid, Stevens, 2005[49]	N=3,406 CA grade school children.	Lacking a regular provider ("one person you think of as your child's personal doctor or nurse") is associated with a lower likelihood of having good communication and care coordination, measured by how well the doctor explains things, listens, knows about the child's visits to specialists, and follows up on problems.	Comm. and Coord.
Heisler et al. 2002[82]	N=1,314, veteran diabetic adults	Better provider communication, measured by explaining the disease, treatment alternatives, and side-effects of medications is associated with better treatment adherence, in terms of medication taking, diet, blood glucose monitoring, and foot care.	Other
Mollborn et al. 2005[83]	1998-99 CTS	Greater provider trust, measured by a 4-item trust scale, is associated with significantly lower probability of delaying care and having an unmet health care need.	Other
Nelson et al. 2005[84]	N=564 HI Healthy Start participants	Greater provider trust, measured by a 4-item trust scale, is associated with greater likelihood to follow the physician's advice on relevant anticipatory guidance topics.	Other
Stille et al. 2006[85]	N=184 UofMA clinic, ages 0-18	Greater care coordination, measured by specialists receiving referral communication from the PCP, is associated with specialists reporting they were able to provide "optimal care."	Other

The conceptual model integrates the findings from these studies and contends having a usual source of care denotes a greater continuity of care, which leads to improved care coordination, communication, treatment adherence, and optimal care. The analysis tests whether having a usual source of care when ambulatory care is obtained translates into fewer emergency room visits and hospitalizations when the child has a chronic condition that needs ongoing treatment (Figure 2.5).

Figure 2.5: Having a usual source of care denotes continuity

Prenevost, 2007

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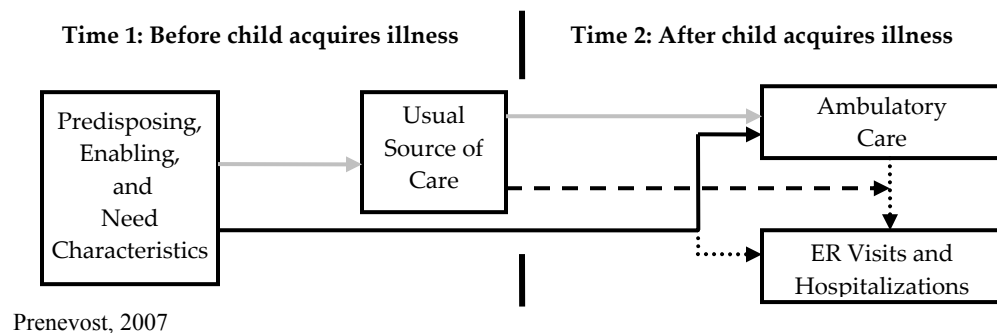
III. Making Methodological Decisions

The major methodological decision made in this study was how to address selection bias. The following details the information from previous studies used to inform this methodological decision.

A. Addressing Selection Bias

As explained in Section I.A, in non-randomized studies, selection bias can occur when there is one or more unmeasured variables related to obtaining treatment (having a usual source of care) that is also related to the outcome being measured (obtaining medical care). For example, the severity of an individuals' chronic condition may affect the likelihood the individual has a usual source of care as well as the likelihood that they seek care. Ignoring selection bias can result in misleading or inaccurate findings.

In observational studies, there are generally two lines of thought in dealing with selection bias. The first is to deal with selection bias using propensity score methods. A propensity score is defined as the "conditional probability of being treated given the individual's covariates."[86] With this method, the propensity score is estimated as a scalar value using a logistic regression model or discriminant analyses.[86,87] Once the propensity score is estimated, it can be used 1) to match individuals in the control population to those in the study population, 2) to stratify control and study participants into groups with similar probabilities of obtaining treatment, and 3) as a variable in the multivariate regression analyses. [86, 87]

Proponents of propensity scores argue, "if one has the ability to measure many of the covariates that are believed to be related to treatment assignment, then one can be fairly confident that approximately unbiased estimates for the treatment effect can be obtained."[86] However, the major disadvantage of propensity score methods is they can not account for any unobservable characteristics that may be related to choosing to have a usual source of care.[87-89]

The second method to deal with selection bias uses instrumental variables. Instrumental variable methods can be thought of as a pseudo-randomization method because similar to randomization, the *instruments*, or variables, incorporated into the regression model predict the treatment but are not correlated with the unobserved

variables in the unexplained variance, or error term, when estimating the treatment effects (Figure 2.6).[90]

Figure 2.6 Depiction of instrumental variable methods
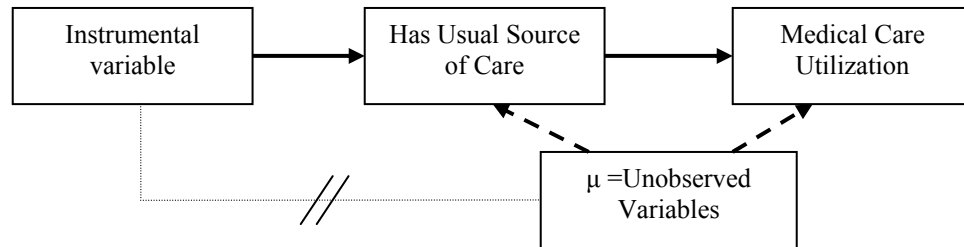
When appropriate instruments are available, one can separate the amount of variation generated by instrument from the variation generated from the treatment, and thereby remove the effects of unobservable characteristics related to selecting treatment and the outcome being measured.[90] A recent study conducted by Stuckle et al. shows that the estimates generated from using instrumental variables more closely replicated findings from a randomized control study compared to estimates generated using propensity score stratification and matching.[87]

The major limitation in using instrumental variables is finding suitable instruments. In order for an instrument to be effective, two important criteria need be met. First, the instrument must be strongly correlated with the treatment.[87,90-92] This means the instrument can predict the likelihood of the individual receiving the treatment. Second, the instrument must not be correlated with the unobserved variables in the error term (μ) that are related to the treatment and the outcome.[90-92] When these criteria are not met, the accuracy of the findings is limited. Specifically, when the first criterion is violated, the standard errors become too large, which can mask the effect of the treatment.[90-91] When the second criterion is violated, the results from the instrumental variable estimates remain biased.[90]

Because the primary concern in this study is the potential for unmeasured variables being related to choosing to have a usual source of care and medical care utilization, the most appropriate method is the instrumental variable method.

Chapter 3: Methodology

This chapter describes the data set and study population, outlines the study variables, and details the analyses used to determine how having a usual source of care affects medical care utilization when a child acquires, or has an episode of, one of three types of health conditions.

I. The MEPS Dataset

The study data are drawn from household component of the Medical Panel Expenditure Survey (MEPS).[93] The Agency for Healthcare Research and Quality (AHRQ) has conducted MEPS annually since 1996, and it is the most complete source of nationally-representative medical care utilization and expenditure data for the non-institutionalized population.[93]

Households selected to participate in MEPS are sampled from households that participated in the National Health Interview Survey (NHIS) during the previous year.[94] The NHIS is sponsored by the National Center of Health Statistics and provides a nationally representative sample by using a complex, multi-stage sample design.[94] The multi-stage sample design includes:

- Primary sampling units (PSUs), consisting of one or more counties,
- Density strata, reflecting the concentration of minority populations, and
- Supersegments, which are clusters of housing units.[94]

Survey information from approximately three-eighths of the households responding to the NHIS is made available to MEPS. MEPS then subsamples a portion of these households for interviewing.[94] The target population for MEPS is the U.S. civilian, non-institutionalized population.[94] With this as the target, the primary coverage limitation for MEPS is that new households are created after the NHIS interviews and are therefore not able to be included in the creating the sample.[94] Examples of new households include recently immigrated households and U.S. citizens returning from living in another country, departing the military, or leaving an institution.[94]

MEPS is a longitudinal dataset that is conducted using an overlapping panel design.[94] MEPS selects a new panel of households each year and collects data through five rounds of interviews to cover a two-year period.[94] A longitudinal weight variable is

included in MEPS, which enables researchers to make national estimates of person-level changes in selected variables.[94] The weight includes an adjustment for non-response for all the study rounds and corresponds to national estimates for the civilian non-institutionalized population provided by the Census Bureau.[94] Table 3.1 shows the number of sampled households and the response rate for each panel.

Table 3.1 MEPS Sample Households and Response Rate, by Survey Panel

Panel	2	3	4	5	6	7	8	9
Sampled Households	6,300	5,166	6,900	5,380	10,651	8,083	8,357	8,604
Response Rate	64.0%	67.6%	66.1%	65.4%	64.0%	62.9%	62.7%	60.3%

Source: MEPS 1997-2005 full-year consolidated data file documentation[94]

MEPS uses computer assisted personal interviewing (CAPI) technology to collect information from a single household respondent about each household member.[94] The respondent is the head of household or a household member 16 years of age or older who owns or rents the home.[94]

II. The Study Population

The study population includes children ages 0 to 17 who have or acquire one or more of the selected study conditions from 1997-2005[3],[4]. Study conditions were selected from three categories of health conditions: 1) chronic conditions, 2) conditions sensitive to ambulatory care, and 3) acute conditions not sensitive to obtaining ambulatory care.

Chronic conditions are based on the classification developed by AHRQ as part of the Hospital Cost and Utilization Project (HCUP). AHRQ defines chronic conditions as "conditions that last 12 months or longer and meets one or both of the following tests: (a) it places limitations on self-care, independent living, and social interactions; (b) it results in the need for ongoing intervention with medical products, services, and special equipment."[95] A physician panel, health services researchers with clinical backgrounds, and expert medical coders reviewed each of the diagnosis codes and determined whether the code represented an acute or chronic condition based on AHRQ's definition.[95]

Conditions sensitive to ambulatory care are commonly known Ambulatory Care Sensitive (ACS) conditions. ACS conditions are conditions for which effective and

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[3] Multiple years were aggregated to increase sample size. The first panel is excluded because it does not contain information on having a usual source of care.

[4] About 10% of the individuals in the longitudinal MEPS population do not have data available for all 5 rounds, including those who were born during the survey period. For this study, the child had to be born by round 2, when both the demographic variables and having a usual source of care were established.

timely ambulatory care can help to reduce the risk for emergency room visits and hospitalizations.[56,60] ACS conditions among children include anemia, asthma, bronchitis, cellulitis, dehydration, diabetes, epilepsy, gastroenteritis, pneumonia, severe ear, nose, and throat infections, and kidney or urinary tract infections.[61-65]

Acute conditions not sensitive to ambulatory care are conditions that are classified as acute by the HCUP development effort[95] and have not been identified as an ACS conditions by clinicians or researchers.[61-65] The specific acute, chronic, and ACS study conditions were then selected based on prevalence (Table 3.2).[96-97]

Table 3.2: Health Conditions

Condition	ICD-9 codes	Annual Visits Per 100 Children
Acute Conditions		
Common cold	460	24.2
Influenza	487	4.0
Sore throat	034 and 462	14.8
Otitis Media*	381 and 382	35.2
Pneumonia *	466, 480, 482, 485,	4.0
Urinary Tract Infections *	590, 595, 599	1.8
Gastroenteritis*	008, 009, 558	1.1
Chronic Conditions		
Asthma*	493	7.2
Allergic Rhinitis	477	9.3
Chronic Sinusitis	473	9.3

Source: National Center for Health Statistics, 2006[96]
*Conditions sensitive to ambulatory care (ACS conditions).[61-65] Asthma is analyzed as a chronic and ACS condition.

Conditions are identified by the respondent in any of three ways: as a 1) reason for medical care utilization, 2) reason for one or more disability days, or 3) condition that has "bothered" the individual during the reference period. The conditions are initially recorded by the interviewers as verbatim text, with professional coders subsequently recoding them to *International Classification of Diseases, Ninth Revision* (ICD-9) codes.

The translation from verbatim text to diagnosis codes is verified and error rates have not exceeded 2.5 percent for any coder. However, the self-report of condition information is still limited by the ability of a household respondent to accurately remember and report the condition. Studies of the 1987 National Medical Care Expenditure Survey, which is the original version of MEPS, indicate household agreement with provider reports for the selected study conditions range from 23-56

percent for the study conditions.[99-100] However, the questions obtaining this information have since been modified to enhance the accuracy of reporting.[100]

III. Study Variables

A. Intervention Measures

The presence of a usual source of care is derived from the respondent through two questions in the MEPS survey regarding each individual's usual source of care. I first determined the presence of a usual source of care using the question indicating that the individual has "a particular doctor's office, clinic, health center, or other place that [he/she] usually goes to if he/she is sick or needs advice about his/her health."[94] I excluded emergency rooms from either definition using the question asking if the usual source of care is a "hospital emergency room."[94]

B. Outcome Measures

The outcomes for this study are measures of whether or not children use specific types of medical care. The outcomes include outpatient visits, office-based visits, hospital stays, and emergency room visits associated with the specific health condition being examined (Table 3.3).

Table 3.3: Outcome Measures

Measure	Description	Values
Ambulatory care Visits	Outpatient and office-based events associated with the condition	1= Child received ambulatory care 0= Child did not receive ambulatory care
ER Visits and Hospital Stays	Emergency room visits and Hospital stays associated with the condition.	1= Child used the ER or had a hospital stay 0= Child did not use the ER or hospital

Outpatient or office-based visits represent access to ambulatory care. When the child's condition is sensitive to obtaining care, hospital and emergency room visits indicate the inefficient delivery of care and signal ambulatory care was not provided, or not provided in a timely manner. When a child has a chronic condition, hospital and emergency room visits indicate that ambulatory care lacked appropriate care coordination or effective communication that could have improved treatment delivery or adherence.

C. Confounding Variables

The confounding variables in the study account for any predisposition a child has to use healthcare; individual, family, or community factors which enable or impede use;

and the child's need for care (Table 3.4). The study examines the effect each of these variables has on the likelihood of having a usual source of care as well has their impact on medical care utilization.

D. Instrumental Variables

The study also identifies instrumental variables to adjust for the effects from any unobservable measures related to the individual choosing to have a usual source of care. Unobservable measures include the accessibility of providers in a child's area, a child's propensity to use medical care, and a child's exposure to illness. These measures can not be captured directly by the variables in the dataset, but may be strongly related to medical care utilization and likelihood of having a usual source of care. Using instrumental variables addresses these issues and reduces selection bias.

Table 3.4: Confounding and Instrumental Variables

Measure	Description	Values
Predisposing		
Age	Age of child	1= 0-5 years old 2= 6-12 years old 3= 13-17 years old
Sex	Sex of child	1= Male 0= Female
Race/Ethnicity	Race and ethnicity of the child	1= Non-Hispanic White 2= Non-Hispanic Black 3= Hispanic 4= Non-Hispanic Other Race
Family Structure	Marital status of parents who the child lives with	1= Married parents 2= Single parent 3= Other
Language	Language of Interview	1= English 2= Non-English
Enabling		
Insurance Type	Type of insurance	1= Private 2= Public (Medicaid/SCHIP) 3= Uninsured
Family Income	Family income as a percent of the federal poverty line	1= <100%FPL 2= 100-199%FPL 3= 200-399%FPL 4= 400%FPL+
Paternal Education	Highest education obtained by a family member in the household age 16 or older	1= Less than high school 2= High school graduate 3= More than high school
Region	US region where the child lives	1= Northwest 2= Midwest 3= South 4= West
Urbanity	Whether child lives in a metropolitan statistical area (MSA)	1= Lives in MSA 0= Does not live in a MSA

Measure	Description	Values
Need		
General Health	Perceived health status	1= Excellent or very good
		2= Good
		3= Fair or poor
Disability	Has a disability that enables child to receive SSI	1 = Has disability
		0 = No disabilities
Chronic condition	Condition lasts at least 12 months and it requires ongoing medical services.	1= Has chronic condition
		0= No chronic conditions
Instrumental Variable		
Recently Moved	Child moved within past year	1= Moved within past year
		0= Did not move
Gatekeeper Plan	Child's insurance plan requires a referral from a PCP in order to see a specialist	1= Gatekeeper plan
		0= Does not have a gatekeeper

The variable denoting whether or not the child moved in the past year is a documented (not self-reported) MEPS variable that indicates a change in the individual's address from the previous reference period,[94] and it is likely an appropriate instrumental variable because previous research as shown that compared to their peers, children who moved in the previous 12 months were significantly more likely to lack a usual source of care, but were not more likely to use an emergency room when they became sick.[101] Furthermore, a previous study has shown this variable to be an appropriate instrument when examining the effect of having a usual source of care and preventive care among children.[32]

The variable indicating whether or not the child is required to get a referral in order to see a specialist is also likely to be an appropriate instrumental variable because children who are required to get a referral are typically assigned or forced to choose a ambulatory care provider, so they are more likely to have a usual source of care.[102] Furthermore, previous studies have shown that having an insurance plan that uses this gatekeeping arrangement does not affect ambulatory care medical care utilization among children.[103-104]

To substantiate the appropriateness of these instruments, the study tests the strength of the relationship between the instruments and having a usual source of care to determine whether the instruments are highly correlated with the intervention. In addition, I test the correlation of the instruments to observable independent variables such as age and health status that likely affect medical care utilization when they acquire one of the study conditions. Although this second test does not prove the appropriateness of

the instruments, it has been used by several studies as way to partially test the assumption that the instrumental variable is not correlated with the unobservable variables in the error term.[90,105-106]

IV. Data Management

A. The Household Files

Information about socio-demographics, health insurance, health status, and access to care is collected by MEPS through five rounds of surveys across a two-year period for each participant. The resulting calendar-year consolidated household data files contain a year's worth, or only half of the two-year period, of the information necessary for each participant. As a result, the first step in data management is aggregating all five rounds of data across the appropriate two-year periods for each participant.

Nine full-year consolidated household data files were downloaded from the MEPS website (years 1997-2005). Each yearly dataset contains information for two panels, and the majority of variables in the dataset represent a different round of information depending on which panel the variable was collected. For example, the variable *age42x* represents round 4 for the earlier panel (ex: panel 8) and round 2 for the later panel (ex: panel 9).

To aggregate all five rounds of data for each participant, the yearly data files were separated into their two panels using the panel indicator, and the variables in the separated datasets were relabeled to clearly indicate which round of data it contained. For example, the 2004 file was separated into a panel 9 dataset and a panel 8 dataset. Variables in the two datasets were then relabeled to reflect the appropriate round (ex: age4x for panel 8 and age2x for panel 9). After all nine of the full-year datasets were separated by panels and the variables were relabeled, the panel datasets were merged back together by the unique person ID, with each record containing all five rounds of information for each participant (ex age1x, age2x, age3x, age4x, and age5x).

B. The Condition Files

The medical condition files contain the condition-specific data for the participants. The condition is the level of observation, and each record enumerates the person having the condition, the round during which the condition was experienced, and

the medical care utilization associated with the condition. Information from the medical conditions files is linked to the household files using the unique person ID.

C. The Final Study Data Files

The final data set included 16,266 children who had 31,207 occurrences of the selected study conditions. This sample represents 48.1% of the total child population included in the survey. There were 15 children (having 24 occurrences of the selected study conditions) excluded from the study since they did not have a member in the household older than 16 years of age who provided information on their level of education.

V. Analyses

The study uses univariate analyses to describe the population, bivariate analyses to identify significant relationships, and multivariate models to estimate independent effects of having a usual source of care. Because MEPS uses a complex sampling design, the study reports both the unweighted and weighted results. The weighted results ensure more accurate standard errors and parameter estimates because they account for clustered sampling, oversampling, and survey nonresponse.[107-108] The unweighted results are used to check the specification of the model, since the results should be similar when the model fits the data well.[107-108] The analyses are conducted using the statistical computing software, Stata, which can account for MEPS' complex sampling design and population weights.

A. Sample Description

First, I conduct univariate analyses to describe the study population. This analysis includes the proportion of children who have a usual source of care; the proportion of children who have each of the conditions listed in Table 3.2; the proportion of children using each type of medical care in Table 3.3; and the distribution of each sociodemographic characteristic included in Table 3.4. For each of these characteristics and measures, I report the sample size of the population, percent, and standard error.

B. Identifying Associations

I use bivariate analyses to identify the significant relationships among the intervention, dependent, predisposing, enabling, and need variables. More specifically,

the analysis examines 1) whether having a usual source of care varies across population characteristics and 2) whether medical care utilization varies across population characteristics, across conditions, or by having a usual source of care. I then examine how having a usual source of care and medical care utilization varies across the proposed instrumental variables. For each analysis, significant differences are determined using chi square tests.

C. Estimating Effects

Several multivariate regression models are used to determine the independent effects of having a usual source of care. The equations are enumerated in the following analytical steps along with an illustration of the relevant component of the conceptual model that they test.

Step 1: *Determine if a usual source of care increases the likelihood of using ambulatory care*

The first step is determining whether a usual source of care increases the likelihood of utilizing ambulatory care when a child has or acquires one of the selected conditions (Figure 3.2). To determine this, I use the bivariate probit model because unlike the 2-stage instrumental variable method, the bivariate probit model allows for the disturbance terms to be correlated.[109]

Figure 3.2: Having a usual source of care increases the likelihood of using ambulatory care

Prenevost, 2007
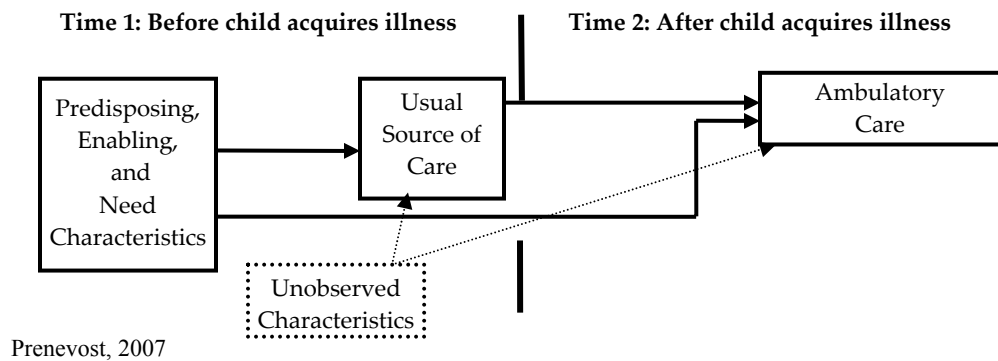
The bivariate probit model is comprised of two equations. The first equation estimates whether the child has a usual source of care and the second equation estimates the effect of having a usual source of care on their utilization of ambulatory care:

$$Y_{1i} = Y_{2i}\,\beta + X_{Ii}Y + u_i, \tag{1}$$

$$Y_{2i} = X_{1i}\Pi_1 + X_{2i}\Pi_2 + v_i, \tag{2}$$

Where i=1…N children, Y_{2i} is a vector of endogenous variables (whether child has a usual source of care), X_{1i} is a vector of exogenous variables (sex, age, race/ethnicity, etc.), and X_{2i} is a vector of instruments (moved, supply, and gatekeeper).

This model is used not only to confirm the presence of selection bias by simultaneously estimating the probability of having a usual source of care and the probability of having a ambulatory care visit, but it is also used to estimate the effect of having a usual source of care when selection bias is present.

For this model, the unit of analysis is the child-condition, meaning each occurrence of the study condition for each child is a unique record, and children are in the analysis multiple times according to how many occurrences of the study conditions they experience.[5] For the characteristics that vary across rounds (ex: age, insurance, etc.), I use the responses that were collected during the same round that the condition occurred.

Step 2: Determine if having a usual source of care decreases the likelihood of an emergency room visit or hospitalization among children acquiring ambulatory care sensitive conditions.

The second step is determining whether a usual source of care decreases the likelihood of having an emergency room visit or hospitalization when a child acquires an ambulatory care sensitive condition (Figure 3.3). This analysis parallels the analyses describe in the first step, but this time the outcome is whether or not the child has an emergency room visit or hospitalization.

Again, I use the bivariate probit model, for which the first equation estimates whether the child has a usual source of care and the second equation estimates the effect of having a usual source of care on emergency room visits and hospitalizations:

$$Y_{1i} = Y_{2i}\,\beta + X_{Ii}Y + u_i, \tag{1}$$

$$Y_{2i} = X_{1i}\Pi_1 + X_{2i}\Pi_2 + v_i, \tag{2}$$

Where i=1…N children, Y_{2i} is a vector of endogenous variables (whether child has a usual source of care), X_{1i} is a vector of exogenous variables (sex, age, race/ethnicity, etc.), and X_{2i} is a vector of instruments (moved, supply, and gatekeeper).

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[5] A sensitivity analysis was conducted to determine whether the results were dependent upon clustering effects. Multivariate analyses (Appendix F) shows models that account for clustering produce similar results to models that do not account for clustering.

Figure 3.2: A usual source of care decreases the likelihood of ER/Hospital care among children who acquire an ambulatory care sensitive condition
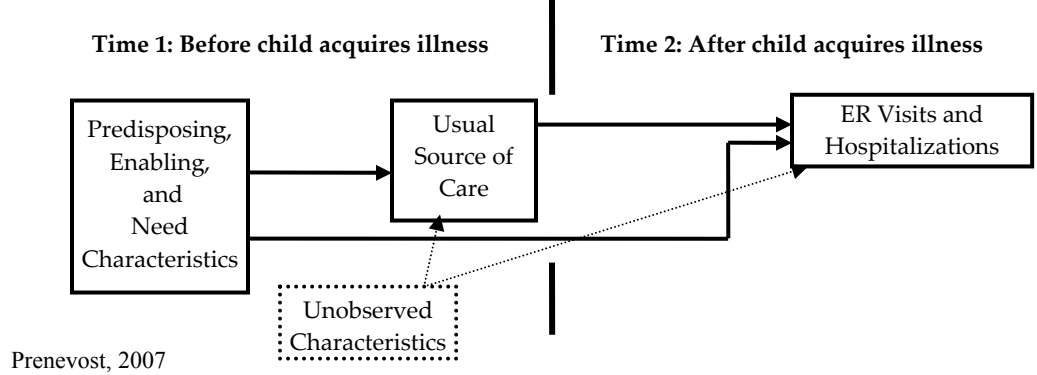
Prenevost, 2007

Again, the unit of analysis is the child-condition, meaning each occurrence of the study condition for each child is a unique record, and children are in the analysis multiple times according to how may occurrences of the study conditions they experience. For the characteristics that vary across rounds (ex: age, insurance, etc.), I use the responses that were collected during the same round that the condition occurred.

Step 3: Determine if having a usual source of care decreases the likelihood of an emergency room visit or hospitalization among children who have an episode of a chronic condition and use ambulatory care.

The final step is determining whether having a usual source of care decreases the likelihood of having an emergency room visit or hospitalization among children who have an episode of a chronic condition and use ambulatory care (Figure 3.4).

Figure 3.3: Having a usual source of care decreases the likelihood of ER/Hospital care among children who have a chronic condition and use ambulatory care

Prenevost, 2007
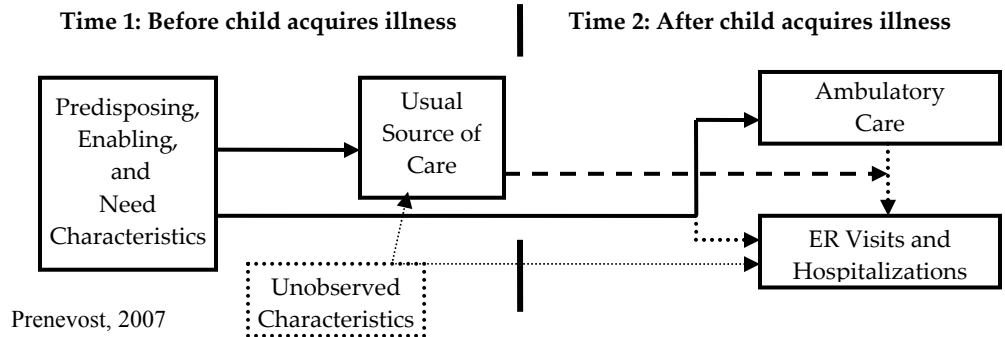
This analysis is very similar to that completed for the first and second steps, but with the analyses, the population is limited to children who use ambulatory care and the

outcome is an emergency room visit or hospitalization. Again, I use the bivariate probit model, where the first equation estimates whether the child has a usual source of care and the second equation estimates the effect of having a usual source of care on the likelihood of having an emergency room visit or hospitalization:

$$Y_{1i} = Y_{2i}\,\beta + X_{1i}Y + u_i, \tag{1}$$

$$Y_{2i} = X_{1i}\Pi_1 + X_{2i}\Pi_2 + v_i, \tag{2}$$

Where i=1…N children, Y_{2i} is a vector of endogenous variables (whether child has a usual source of care), X_{1i} is a vector of exogenous variables (sex, age, race/ethnicity, etc.), and X_{2i} is a vector of instruments (moved, supply, and gatekeeper). Again, the unit of analysis is the child-condition, meaning each occurrence of the study condition for each child is a unique record, and children are in the analysis multiple times according to how may occurrences of the study conditions they experience. For the characteristics that vary across rounds (ex: age, insurance, etc.), I use the responses that were collected during the same round that the condition occurred.

Chapter 4: Results

I. The Univariate Analyses

A. Child-Condition Level

Tables 4.1-4.6 describe the study population at the child-condition level, meaning each occurrence of the study condition for each child is a unique record (n=31,207), and children may be in the analysis multiple times according to how may occurrences (or exacerbations) of the study conditions they experienced.[6] Several of the characteristics examined, including age, insurance status, poverty level, region, urbanity, and health status, can vary across rounds. For these variables, I use the responses that were collected during the same round that the condition occurred.

Table 4.1 details the prevalence of study conditions and shows the distribution of children who have the condition more than once during the study period (MEPS survey rounds 3-5).

Table 4.1: Occurrences of Study Conditions Among Children during the Study Period

	N	1 occurrence	2 occurrences	3+ occurrences
Study Conditions				
1= cold	8,867	72.9%	20.1%	7.0%
2=flu	3,058	77.2%	18.9%	3.8%
3=sore throat	3,554	70.8%	23.7%	5.4%
4=otitis media	4,966	59.4%	29.9%	10.7%
5=pneumonia	662	70.1%	28.3%	1.6%
6=urinary tract infection	589	73.4%	24.4%	2.2%
7=gastroenteritis	4,825	83.5%	14.8%	1.7%
8=asthma	1,384	60.2%	37.5%	2.4%
9=allergies	1,818	81.4%	17.8%	0.8%
10=chronic sinusitis	1,484	70.8%	23.6%	5.5%

The table shows colds are the most frequently acquired study condition (27.0%) and urinary tract infections are the least prevalent (1.9%). Most children have only 1 occurrence of each study condition, with otitis media and asthma having the highest percentage of children having the condition more than one time during the study period.

Table 4.2 table shows the frequency of having a usual source and the outcome measures for the study sample. The majority of the study conditions (93.1%) occurred among children who had a usual source of care. The table also shows that just over half

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[6] Analyses completed at the child-level, rather than the condition-level, can be found in Appendix A.

of the study conditions result in an ambulatory care visit (57.2%), but very few result in an ER visit or hospital stay (4.3%).

Table 4.2: Intervention and Outcome Measures at the Condition Level

	N	Percent	Weighted Percent	Weighted SE
Usual Source of Care				
0= No usual source of care	2,597	8.3	6.9	0.39
1= Has a usual source of care	28,610	91.7	93.1	0.39
Ambulatory Care Visits				
0 = Did not receive ambulatory care	17,849	57.2	56.5	0.46
1 = Received ambulatory care	13,358	48.8	43.6	0.46
Hospital Stays or ER Visits				
0 = Did not have an hospital stay or ER visit	29,951	96.0	96.3	0.15
1 = Had an hospital stay or ER visit	1,355	4.3	3.8	0.15

Table 4.3 describes the predisposing characteristics of the study sample. The study conditions are almost evenly split between females and males, and most of the study conditions were experienced by children younger than age 13 (79.7%). In addition, most of the study conditions were experienced by Non-Hispanic White children (54.7%), children who lived with two married parents (65.6%), and children who lived in homes where English is spoken (85.6%).

Table 4.3: Predisposing Characteristics at the Condition Level

	N	Percent	Weighted Percent	Weighted SE
Sex				
0=Female	15,436	49.5	49.1	0.61
1=Male	15,771	50.5	50.9	0.61
Age				
1=0-5 years old	12,684	40.6	41.5	0.68
2=6-12 years old	12,209	39.1	37.9	0.57
3=13-17 years old	6,314	20.2	20.6	0.46
Race/Ethnicity				
1=Non-Hispanic White	17,076	54.7	71.6	0.88
2=Non-Hispanic Black	3,734	12.0	9.3	0.48
3=Hispanic	9,016	28.9	14.6	0.75
4=Non-Hispanic Other	1,381	4.4	4.5	0.32
Family Status				
1=Married Parents	20,465	65.6	70.8	0.70
2=Single Parent	6,705	21.5	18.1	0.53
3=Other	4,037	12.9	11.1	0.47
Language				
0=Non-English	4,506	14.4	6.1	0.38
1=English	26,701	85.6	93.9	0.38

Table 4.4 describes the enabling characteristics of the study sample. The majority of the study conditions occurred among children who had some type of insurance (69.6% private and 22.4% public). In addition, most of study conditions occurred among children who live with families making more than 100% of the federal poverty level (FPL) (87.4%) and having a least one household member with an education of high school or above (84.6%). The study conditions occurred more often among children living in the South (35.4%) and less often among children living in the North (14.7%), and the majority of study conditions occurred among children living in MSAs, or urban areas (78.8%).

Table 4.4: Enabling Characteristics at the Condition Level

	N	Percent	Weighted Percent	Weighted SE
Insurance				
1= Private	18,024	57.8	69.6	0.78
2=Public	10,210	32.7	22.4	0.68
3=Uninsured	2,973	9.5	8.0	0.33
Income				
1= Less than 100% FPL	7,064	22.6	14.8	0.53
2=100-199% FPL	7,651	24.5	20.1	0.56
3=200-399% FPL	9,516	30.5	34.3	0.66
4= 400%+ FPL	6,976	22.4	30.9	0.79
Highest Household Education				
1=Less than High School	4,794	15.4	8.5	0.36
2=High School Grad	8,988	28.8	25.4	0.69
3=More than High School	17,425	55.8	66.1	0.80
Region				
1=Northeast	4,599	14.7	17.6	1.23
2=Midwest	6,850	22.0	25.6	1.62
3=South	11,045	35.4	32.8	1.62
4=West	8,713	27.9	24.0	1.73
MSA				
0=Does not live in a MSA	6,605	21.2	19.3	1.15
1=Lives in a MSA	24,602	78.8	80.7	1.15

Table 4.5 describes the need characteristics of the study sample. Most of the study conditions occurred among children who were fairly healthy. The majority of study conditions occurred among children who were in excellent of very good health (94.5%), who did not have disabilities (98.6%), and who did not have chronic conditions (27.1%).

Table 4.5: Need Characteristics at the Condition Level

	N	Percent	Weighted Percent	Weighted SE
Health Status				
1=Excellent or very good	21,878	70.1	73.9	0.64
2=Good health	7,607	24.4	21.6	0.56
3=Fair or poor	1,722	5.5	4.4	0.26
Disability				
0= No disabilities	30,776	98.6	99.0	0.12
1= Has a disability	431	1.4	1.0	0.12
Chronic Condition				
0=No Chronic conditions	22,756	72.9	71.8	0.59
1=Chronic condition	8,451	27.1	28.4	0.59

Table 4.6 describes the distribution of the instrumental variables for the study sample. The majority of study conditions occurred among children who did not move (98.0%) and among children who did not have a gatekeeper form of an insurance plan (89.7%).

Table 4.6: Instrumental Variables at the Condition Level

	N	Percent	Weighted Percent	Weighted SE
Has the Child Moved				
0=Did not move	30,536	97.9	98.0	0.20
1=Moved within past year	671	2.2	2.0	0.20
Does the Child have a Gatekeeper				
0=Does not have gatekeeper plan	28,187	90.3	89.7	0.52
1=Has gatekeeper plan	3,020	9.7	10.4	0.52

To note: There were 340 child-condition observations for acute conditions, 253 for ACS conditions and 103 for chronic conditions.

II. The Bivariate Analyses

The bivariate analyses serve two main purposes. The first is examining the significant relationships among the intervention, dependent, predisposing, enabling, and need variables. Understanding these bivariate relationships is useful when re-examining the relationships in the multivariate analyses. The final purpose is examining the quality of the instrumental variables. Appropriate instruments should be strongly correlated with the treatment variable and not significantly related to any unobserved variables in the error tem. The bivariate analyses are not used to trim models for fear of overfitting.

The bivariate analysis is divided into four major sections. The first section examines whether having a usual source of care varies across predisposing, enabling, and characteristics. The second section explores how ambulatory care utilization varies by having a usual source of care; across predisposing, enabling, and need characteristics; and

across study conditions. The third section explores how ER and hospital utilization varies by having a usual source of care; across predisposing, enabling, and need characteristics; and across study conditions. The final section looks at how having a usual source of care and medical care utilization varies across the proposed instrumental variables.

For these analyses, I present the unweighted sample size (n), the weighted percent and standard error, and whether the association was significant according to chi square tests. The unit of analysis is the child-condition, meaning each occurrence of the study condition for each child is a unique record (n=31,207), and children can by in the analysis multiple times if they have more than one occurrence of the study condition. For the characteristics that vary across rounds (ex: age, insurance, etc.), I use the responses that were collected during the same round that the condition occurred.

A. Having a Usual Source of Care

Table 4.7 shows how having a usual source of care varies according to predisposing characteristics.

Table 4.7: Having a Usual Source of Care, by Predisposing Characteristics

	N	Usual Source of Care (Wtd %)	St Err	Significance Testing (p-values)*
Sex				
0=Female	15,436	93.2%	0.50%	1(.6570)
1=Male	15,771	93.0%	0.46%	
Age				
1=0-5 years old	12,684	95.3%	0.49%	2(<.0001), 3(<.0001)
2=6-12 years old	12,209	92.3%	0.60%	3(<.0030)
3=13-17 years old	6,314	90.0%	0.63%	
Race/Ethnicity				
1=Non-Hispanic White	17,076	94.1%	0.46%	2(<.0240), 3(<.0001),4(.4320)
2=Non-Hispanic Black	3,734	92.2%	0.98%	3(<.0001),4(.3595)
3=Hispanic	9,016	87.0%	0.87%	4(<.0001)
4=Non-Hispanic Other	1,381	93.6%	1.07%	
Family Status				
1=Married Parents	20,465	94.1%	0.47%	2(<.0001), 3(<.0001)
2=Single Parent	6,705	91.2%	0.68%	3(.1890)
3=Other	4,037	89.7%	0.97%	
Language				
0=Non-English	4,506	82.2%	1.49%	1(<.0001)
1=English	26,701	93.8%	0.40%	

*Indicates the level of significance between the current row and numbered row within the same category. For example, 2 (<.0001), 3(<.0001) in the "1=0-5 years old" row shows the difference between children ages 0-5 and children ages 6-12 is significant: 2(<.0001) and the difference between children younger than 5 and children ages 13-17 is significant: 3(<.0001).

The percent of males and females having a usual source of care is essentially equivalent (93.3% and 93.0%), but a greater percent of young children have a usual source of care than older children (95.3% vs. 90.0%). Having a usual source of care also varies across race/ethnicity, family status, and language. A smaller percent of Hispanic children (87.0%) and children in non-English speaking families (82.2%) have a usual source of care compared to their peers, and a greater percent of children who live with both parents have a usual source of care (94.1%) than children living with single parents (91.2%) or other non-traditional families (89.7%).

Table 4.8 shows having a usual source of care varies according to enabling characteristics.

Table 4.8: Having a Usual Source of Care, by Enabling Characteristics

	N	Usual Source of Care (Wtd %)	St Err	Significance Testing (p-values)*
Insurance				
1= Private	18,024	95.6%	0.37%	2(<.0001), 3(<.0001)
2=Public	10,210	90.4%	0.80%	3(<.0001)
3=Uninsured	2,973	78.6%	1.66%	
Income				
1= Less than 100% FPL	7,064	88.8%	0.88%	2(.6380),
2=100-199% FPL	7,651	89.3%	0.96%	3(<.0001),4(<.0001)
3=200-399% FPL	9,516	94.1%	0.44%	4(<.0050)
4= 400%+ FPL	6,976	96.4%	0.58%	
Highest Household Education				
1=Less than High School	4,794	84.3%	1.21%	2(<.0001), 3(<.0001)
2=High School Grad	8,988	91.1%	0.63%	3(<.0001)
3=More than High School	17,425	95.0%	0.47%	
Region				
1=Northeast	4,599	96.9%	0.43%	2(.0180),
2=Midwest	6,850	95.1%	0.62%	3(<.0001),4(<.0001)
3=South	11,045	91.2%	0.66%	4(.6280)
4=West	8,713	90.7%	0.92%	
MSA				
0=Does not live in a MSA	6,605	93.9%	0.65%	1(.1750)
1=Lives in a MSA	24,602	92.9%	0.43%	

*Indicates the level of significance between the current row and numbered row within the same category.

A greater percent of children covered by private insurance (95.6%) have a usual source of care than uninsured (78.6%) and publicly insured (90.4%) children. The percent of children who have a usual source of care also increases as family income and education levels increase. In addition, the percent of children who have a usual source of

care is slightly greater in the Northeast (96.9%) and Midwest (95.1%) compared to the South (91.2%) and West (90.7%), but the proportions for children who live in MSAs and non-MSAs are essentially the same.

Table 4.9 shows having a usual source of care varies according to need characteristics. Having a usual source of care among children of all levels of health and disability status is essentially the same. Having a chronic condition, however, is one health characteristic for which variation occurs. A greater proportion of children with a chronic condition have a usual source of care than their peers (96.1% vs. 91.9%).

Table 4.9: Having a Usual Source of Care, by Need Characteristics

	N	Usual Source of Care (Wtd %)	St Err	Significance Testing (p-values)*
Health Status				
1=Excellent or very good	21,878	93.2%	0.45%	2(.3900), 3(.5820)
2=Good health	7,607	92.7%	0.54%	3(.9360)
3=Fair or poor	1,722	92.6%	1.15%	
Disability				
0=No disabilities	30,776	93.1%	0.39%	1(.9140)
1=Has a disability	431	92.8%	2.30%	
Chronic Condition				
0=No Chronic conditions	22,756	91.9%	0.47%	1(<.0001)
1=Chronic condition	8,451	96.1%	0.41%	

*Indicates the level of significance between the current row and numbered row within the same category. .

Overall, several predisposing, enabling, and need characteristics have a significant relationship with having a usual source of care (See Figure 4.1). These variables include: age, race/ethnicity, family structure, language, insurance, income, household education, region, and presence of a chronic condition. The multivariate analyses reveal whether these variables remain significant.

Figure 4.1: Conceptual model for children acquiring one of ten common conditions
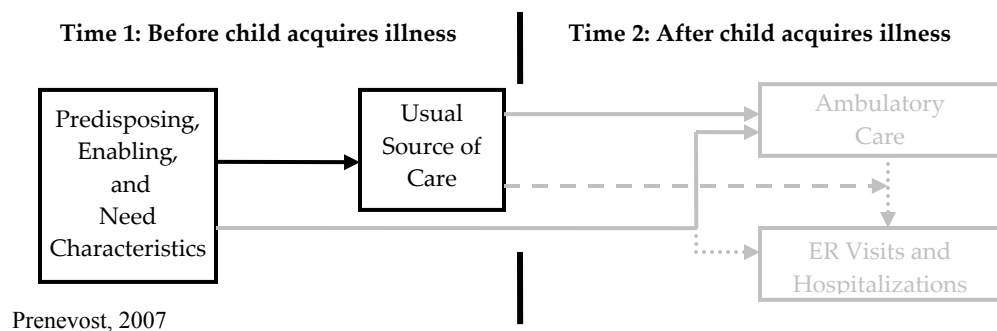
Prenevost, 2007

B. Ambulatory Care Utilization

Table 4.10 shows how any ambulatory care utilization varies by whether or not the child has a usual source of care. When children have the study conditions, a much larger percent of those having a usual source of care use ambulatory care compared to children who do not have a usual source of care (44.6% vs. 29.8%).

Table 4.10: Ambulatory Care Utilization, by Having a Usual Source of Care

	N	Usual Source of Care (Wtd %)	St Err	Significance Testing (p-values)*
0=No Usual Source of Care	2,597	29.8%	0.66%	1(<.0001)
1=Usual Source of Care	28,610	44.6%	0.15%	

*Indicates the level of significance between the current row and numbered row within the same category.

Table 4.11 shows how ambulatory care utilization varies according to predisposing characteristics. For children having the study conditions, utilization of ambulatory care is slightly higher for females and younger children compared to males and older children. Ambulatory care utilization also varies across race/ethnicity and family status. A smaller percent of Non-Hispanic Black children use ambulatory care compared to their peers, and a greater percent of children who live with both parents use ambulatory care than children with single parents or other non-traditional families.

Table 4.11: Ambulatory Care Utilization, by Predisposing Characteristics

	N	Usual Source of Care (Wtd %)	St Err	Significance Testing (p-values)*
Sex				
0=Female	15,436	44.6%	0.60%	1(.0060)
1=Male	15,771	42.4%	0.06%	
Age				
1=0-5 years old	12,684	52.1%	0.67%	2(<.0001), 3(<.0001)
2=6-12 years old	12,209	40.0%	0.65%	3(<.0001)
3=13-17 years old	6,314	32.9%	0.84%	
Race/Ethnicity				
1=Non-Hispanic White	17,076	45.2%	0.58%	2(<.0001), 3(.0040),4(.0010)
2=Non-Hispanic Black	3,734	34.8%	1.18%	3(<.0001),4(.0960)
3=Hispanic	9,016	42.4%	0.80%	4(.0510)
4=Non-Hispanic Other	1,381	38.5%	1.88%	
Family Status				
1=Married Parents	20,465	45.8%	0.58%	2(<.0001), 3(<.0001)
2=Single Parent	6,705	38.8%	0.87%	3(.2420)
3=Other	4,037	37.1%	1.12%	
Language				
0=Non-English	4,506	44.9%	1.53%	1(.3780)
1=English	26,701	43.5%	0.48%	

Table 4.12 shows ambulatory care use by enabling characteristics. A greater percent of children who are insured and living in families with higher income and education levels use ambulatory care than their peers when they have a study condition. The percent of children using ambulatory care is also slightly greater in the Northeast (45.7%) and South (47.3%) compared to the Midwest (41.4%) and West (39.1%), but the proportions in MSAs and non-MSAs are similar.

Table 4.12: Ambulatory Care Utilization, by Enabling Characteristics

	N	Usual Source of Care (Wtd %)	St Err	Significance Testing (p-values)*
Insurance				
1= Private	18,024	45.2%	0.57%	2(.0120), 3(<.0001)
2=Public	10,210	42.8%	0.76%	3(<.0001)
3=Uninsured	2,973	31.6%	1.41%	
Income				
1= Less than 100% FPL	7,064	40.2%	1.01%	2(.782), 3(.003),4(<.0001)
2=100-199% FPL	7,651	40.6%	0.78%	3(.0010),4(<.0001)
3=200-399% FPL	9,516	44.1%	0.08%	4(.4400)
4= 400%+ FPL	6,976	46.4%	0.85%	
Highest Household Education				
1=Less than High School	4,794	39.7%	1.11%	2(.3850), 3(<.0001)
2=High School Grad	8,988	40.8%	0.78%	3(<.0001)
3=More than High School	17,425	45.1%	0.58%	
Region				
1=Northeast	4,599	45.7%	1.09%	2(.002), 3(.239),4(<.0001)
2=Midwest	6,850	41.4%	0.84%	3(<.0001),4(.0640)
3=South	11,045	47.3%	0.83%	4(<.0001)
4=West	8,713	39.1%	0.87%	
MSA				
0=Does not live in a MSA	6,605	45.1%	0.99%	1(.0790)
1=Lives in a MSA	24,602	43.2%	0.52%	

*Indicates the level of significance between the current row and numbered row within the same category.

Table 4.13 shows ambulatory care utilization varies according to need characteristics. Having a usual source of care is essentially the same by health and disability status, but there is variation by chronic condition. A greater proportion of children with a chronic condition (44.9%) have a usual source of care than their peers (43.0%).

Table 4.13: Ambulatory Care Utilization, by Need Characteristics

	N	Usual Source of Care (Wtd %)	St Err	Significance Testing (p-values)*
Health Status				
1=Excellent or very good	21,878	42.6%	0.5%	2(<.0001), 3(.0220)
2=Good health	7,607	46.1%	0.8%	3(.5480)
3=Fair or poor	1,722	47.3%	2.0%	
Disability				
0=No disabilities	30,776	43.5%	0.5%	1(.4170)
1=Has a disability	431	47.1%	4.3%	
Chronic Condition				
0=No Chronic conditions	22,756	43.0%	0.4%	1(.0360)
1=Chronic condition	8,451	44.9%	0.8%	

*Indicates the level of significance between the current row and numbered row within the same category.

Table 4.14 shows how ambulatory care utilization varies by having a usual source of care by condition. Ambulatory care utilization is greater when children have a usual source of care when children have colds (30.6% vs. 15.9%), the flu (28.5% vs. 17.4%), and otitis media (64.9% vs. 54.2%). Ambulatory care utilization for the remaining conditions does not appear to differ significantly by whether or not the child has a usual source of care.

Table 4.14: Ambulatory Care Utilization, by Having a Usual Source of Care, by Condition

	Usual Source of Care	N	Uses Care (Wtd %)	St Err	Significance Testing (p-values)*
cold	No	870	15.9%	1.70%	<.0001
	Yes	7,997	30.6%	0.90%	
flu	No	376	17.4%	2.80%	0.002
	Yes	2,682	28.5%	1.20%	
sore throat	No	190	59.1%	4.40%	0.192
	Yes	3,364	64.9%	1.00%	
otitis media	No	306	54.2%	3.40%	<.0001
	Yes	4,660	66.4%	0.90%	
pneumonia	No	44	59.2%	8.70%	0.493
	Yes	618	65.3%	2.40%	
urinary tract infection	No	44	64.6%	8.80%	0.378
	Yes	545	72.2%	2.10%	
gastroenteritis	No	429	18.9%	3.10%	0.176
	Yes	4,396	23.8%	0.90%	
asthma	No	114	41.4%	7.00%	0.856
	Yes	1,270	42.8%	2.10%	
allergies	No	158	31.4%	5.00%	0.213
	Yes	1,660	38.1%	1.60%	
chronic sinusitis	No	66	68.1%	7.30%	0.746
	Yes	1,418	65.7%	1.40%	

*Indicates the level of significance between having and not having a usual source of care.

Overall, a much larger percent of those having a usual source of care use ambulatory care compared to children who do not have a usual source of care (Figure 4.2, line A). In addition, there are several predisposing, enabling, and need characteristics that appear to have a significant relationship with children utilizing ambulatory care when they have one of the study conditions (Figure 4.2, line B). These variables include: sex, age, race/ethnicity, family structure, insurance, income, household education, region, and presence of a chronic condition. The multivariate analyses reveal whether these variables remain significant.

Figure 4.2: Conceptual model for children acquiring one of ten common conditions
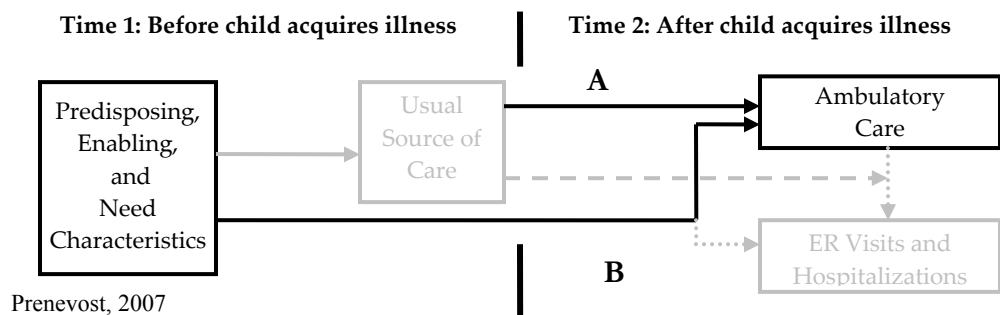
Finally, ambulatory care utilization depending on whether or not the child has a usual source of care appears to be impacted by the type of condition the child has. As a result, results from the multivariate analyses that aggregate conditions together may be influenced more by some conditions than others.

C. ER Visits and Hospitalizations

Table 4.15 shows how ER/hospital use varies by whether or not the child has a usual source of care. When children have the study conditions, a smaller percent of those having a usual source of care use the ER/hospital compared to children who do not have a usual source of care.

Table 4.15: ER/Hospital Utilization, by Having a Usual Source of Care

	N	Usual Source of Care (Wtd %)	St Err	Significance Testing (p-values)*
0=No Usual Source of Care	2,597	5.2%	0.66%	(.009)
1=Usual Source of Care	28,610	3.7%	0.15%	

*Indicates the level of significance between having and not having a usual source of care.

Table 4.16 shows variation in ER/hospital use by predisposing characteristics. The percent of males and females who use the ER/hospital is essentially equivalent, but a

greater percent of the younger children use the ER/hospital than the older children. ER/hospital utilization also varies by race/ethnicity and family status. A greater percent of Hispanic children use the ER/hospital than their peers, and a smaller percent of children who live with both parents use the ER/hospital than children with single parents or other non-traditional families.

Table 4.16: ER/Hospital Utilization, by Predisposing Characteristics

	N	Usual Source of Care (Wtd %)	St Err	Significance Testing (p-values)*
Sex				
0=Female	15,436	3.7%	0.20%	1(.6070)
1=Male	15,771	3.8%	0.20%	
Age				
1=0-5 years old	12,684	5.4%	0.28%	2(<.0001), 3(<.0001)
2=6-12 years old	12,209	2.7%	0.18%	3(.3540)
3=13-17 years old	6,314	2.4%	0.22%	
Race/Ethnicity				
1=Non-Hispanic White	17,076	3.1%	0.16%	2(<.0001),
2=Non-Hispanic Black	3,734	7.1%	0.59%	3(<.0001),4(.0040)
3=Hispanic	9,016	4.6%	0.38%	4(.4240)
4=Non-Hispanic Other	1,381	4.0%	0.71%	
Family Status				
1=Married Parents	20,465	2.9%	0.15%	2(<.0001), 3(<.0001)
2=Single Parent	6,705	5.5%	0.39%	3(.1570)
3=Other	4,037	6.4%	0.56%	
Language				
0=Non-English	4,506	4.4%	0.57%	1(.2070)
1=English	26,701	3.7%	0.15%	

*Indicates the level of significance between the current row and numbered row within the same category.

Table 4.17 shows how ER/hospital utilization varies according to enabling characteristics. A greater percent of children covered by public insurance use the ER/hospital compared to uninsured children and children covered by private insurance. The proportion of children using the ER/hospital also decreases as family income and education levels increase. The percent of children using the ER/hospital is slightly greater in the South compared to the other regions, and ER/hospital utilization is slightly greater for children living in MSAs compared to children living in non-MSAs.

Table 4.17: ER/Hospital Utilization, by Enabling Characteristics

	N	Usual Source of Care (Wtd %)	St Err	Significance Testing (p-values)*
Insurance				
1= Private	18,024	2.8%	0.15%	2(<.0001), 3(.0350)
2=Public	10,210	6.6%	0.42%	3(<.0001)
3=Uninsured	2,973	3.8%	0.48%	
Income				
1= Less than 100% FPL	7,064	6.8%	0.05%	2(.0040),
2=100-199% FPL	7,651	5.1%	0.33%	3(<.0001),4(<.0001)
3=200-399% FPL	9,516	3.3%	0.24%	4(<.0001)
4= 400%+ FPL	6,976	1.9%	0.19%	
Highest Household Education				
1=Less than High School	4,794	6.2%	0.49%	2(.1440), 3(<.0001)
2=High School Grad	8,988	5.3%	0.34%	3(<.0001)
3=More than High School	17,425	2.8%	0.16%	
Region				
1=Northeast	4,599	2.8%	0.28%	2(.0500), 3(<.0001),4(.5810)
2=Midwest	6,850	3.6%	0.84%	3(.0010),4(.1160)
3=South	11,045	5.0%	0.83%	4(<.0001)
4=West	8,713	3.0%	0.87%	
MSA				
0=Does not live in a MSA	6,605	4.6%	0.99%	1(.0020)
1=Lives in a MSA	24,602	3.5%	0.52%	

*Indicates the level of significance between the current row and numbered row within the same category.

Table 4.18 shows variation in ER/hospital utilization by need characteristics. A greater proportion of children who are in fair or poor health or who have a disability use the ER/hospital than their peers. However, children who have a chronic condition do not use the ER/hospital than children who do not have a chronic condition.

Table 4.18: ER/Hospital Utilization, by Need Characteristics

	N	Usual Source of Care (Wtd %)	St Err	Significance Testing (p-values)*
Health Status				
1=Excellent or very good	12,927	3.2%	0.52%	2(<.0001), 3(<.0001)
2=Good health	2,988	4.5%	0.84%	3(<.0001)
3=Fair or poor	351	8.4%	2.00%	
Disability				
0=No disabilities	16,050	3.7%	0.47%	1(<.0001)
1=Has a disability	216	10.3%	4.30%	
Chronic Condition				
0=No Chronic conditions	12,165	3.6%	0.44%	1(.1380)
1=Chronic condition	4,101	4.1%	0.75%	

*Indicates the level of significance between the current row and numbered row within the same category.

Table 4.19 shows how ER/hospital utilization varies by having a usual source of care by condition. ER/Hospital utilization varies by having a usual source of care when children have the flue, sore throats and otitis media, but for the remaining conditions ER/Hospital utilization does not appear to vary by whether or not the child has a usual source of care.

Table 4.19: ER/Hospital Utilization, by Having a Usual Source of Care, by Condition

	Usual Source of Care	N	Uses Care (Wtd %)	Weighted SE	Significance (p-values)*
cold	No	870	0.6%	0.30%	0.398
	Yes	7,997	0.9%	0.10%	
flu	No	376	5.1%	1.70%	0.051
	Yes	2,682	2.4%	0.40%	
sore throat	No	190	6.4%	1.70%	0.018
	Yes	3,364	3.1%	0.40%	
otitis media	No	306	13.8%	3.00%	<.0001
	Yes	4,660	5.2%	0.40%	
pneumonia	No	44	26.3%	9.00%	0.727
	Yes	618	23.2%	2.10%	
urinary tract infection	No	44	8.6%	4.50%	0.299
	Yes	545	12.4%	1.60%	
gastroenteritis	No	429	4.1%	1.00%	0.617
	Yes	4,396	3.6%	0.40%	
asthma	No	114	14.6%	3.60%	0.352
	Yes	1,270	11.3%	1.10%	
allergies	No	158	1.2%	0.80%	0.676
	Yes	1,660	1.6%	0.40%	
chronic sinusitis	No	66	3.8%	2.30%	0.114
	Yes	1,418	1.4%	0.40%	

*Indicates the level of significance between having and not having a usual source of care.

Table 4.20 shows how ER/hospital utilization among children using ambulatory care varies by having a usual source of care by condition. Among children using ambulatory care, ER/Hospital utilization does not vary by whether or not the child has a usual source of care.

Table 4.20: ER/Hospital Utilization for Children Using Ambulatory Care, by Having a Usual Source of Care, by Condition

	Usual Source of Care	N	Usual Source of Care (Wtd %)	St Err	Significance Testing (p-values)*
cold	No	166	0.3%	0.30%	0.258
	Yes	2,523	0.8%	0.20%	
flu	No	84	1.7%	1.50%	0.991
	Yes	834	1.7%	0.50%	
sore throat	No	104	3.2%	2.00%	0.415
	Yes	2,109	1.9%	0.40%	
otitis media	No	165	4.3%	2.50%	0.306
	Yes	3,034	2.4%	0.30%	
pneumonia	No	23	7.3%	4.30%	0.231
	Yes	385	14.9%	2.30%	
urinary tract infection	No	30	13.3%	7.10%	0.451
	Yes	376	8.7%	1.60%	
gastroenteritis	No	90	2.2%	1.50%	0.258
	Yes	1,199	4.8%	0.80%	
asthma	No	45	15.4%	6.50%	0.658
	Yes	544	12.6%	1.90%	
allergies	No	55	0.0%	0.00%	0.645
	Yes	636	1.5%	5.70%	
chronic sinusitis	No	40	3.6%	2.60%	0.174
	Yes	916	1.2%	0.50%	

*Indicates the level of significance between having and not having a usual source of care.

Overall, a similar percent of children who have a usual source of care have ER visits and hospitalizations compared to children who do not have a usual source of care. In addition, there are several predisposing, enabling, and need characteristics that appear to have a significant relationship with children utilizing ER/hospital care when they have one of the study conditions (Figure 4.3, line A).

Figure 4.3: Conceptual model for children acquiring one of ten common conditions

Prenevost, 2007
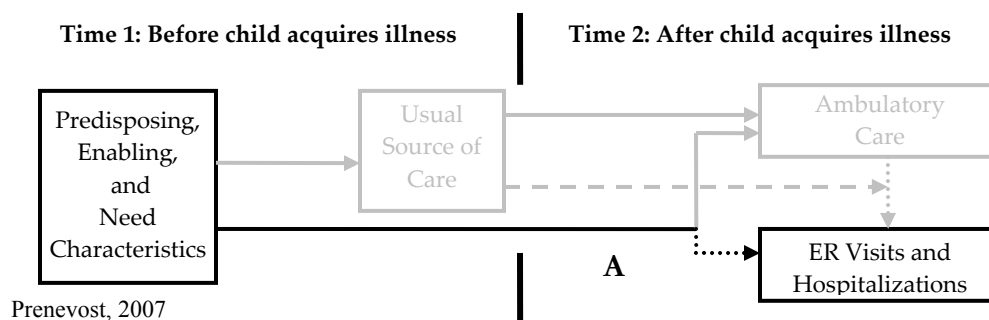
The significant variables include: sex, age, race/ethnicity, family structure, insurance, income, household education, region, and presence of a chronic condition. The multivariate analyses show whether these variables remain significant.

Finally, among children using ambulatory care, ER/Hospital does not appear to depending on whether or not the child has a usual source of care. However, among all children, ER/Hospital utilization, depending on whether or not the child has a usual source of care, does appear to be impacted by the type of condition the child has. Results from the multivariate analyses that aggregate conditions together may be more influenced more by some conditions than others.

D. Instrumental Variables

Good instrumental variables should be highly correlated with the intervention measure (having a usual source of care) but uncorrelated with unobservable variables in the error term.

Moved within the Past Year

Table 4.21 shows how having a usual source of care and medical care utilization vary by whether the child has moved within the past year. Compared to children who did not move, a smaller percent of children who moved have a usual source of care and use ambulatory care, and a larger percent have used the ER/hospital.

Table 4.21: Moved within the Past Year, Usual Source of Care and Medical Care

	Moved	Has Not Moved	Significance
Total	671	30,536	
Has a Usual Source of Care			
Weighted %	65.5%	93.6%	<.0001
SE	.0498	.34%	
Uses Ambulatory Care			
Weighted %	36.2%	43.7%	.007
SE	.0268	.46%	
Uses ER/hospital			
Weighted %	6.1%	3.7%	.016
SE	.0012	.15%	

The strength of the correlation between moving and having a usual source of care appears to be strong with a correlation coefficient of -.1265 at a significance level <.0001 (data not shown). The relationship between moving and the utilization variables also suggests that moving may be an appropriate instrumental variable as good instruments

have a strong relationship with the dependent variable. However, for the instrument to truly work, its correlation with the dependent variable must be due to its correlation with having a usual source of care, which is indicated when the instrument is not correlated with any unobservable variables in the error term.

To discern whether the instrumental variable may be related to unobservable variables in the error term, Table 4.22 shows the relationship between several observable independent variables that are likely correlated with unobservable variables in the error term. In addition to the three health characteristics included as study variables, two other variables are included to represent provider supply and propensity to use medical care.

Table 4.22: Moved within the Past Year, Observable Indicators

	Moved	Has Not Moved	Significance
Total	671	30,536	
Fair/poor health status			
Weighted %	5.2%	4.4%	.538
SE	.0136	.26%	
Has a disability			
Weighted %	1.1%	1.0%	.894
SE	.0036	.12%	
Presence of a chronic condition			
Weighted %	26.8%	28.3%	.614
SE	.0286	.60%	
Propensity to use medical care*			
Weighted %	80.2%	74.3%	.149
SE	.0071	4.45%	
Provider supply			
Weighted Average	86.4%	86.8%	.088
SE	.0023	.03%	

*The MEPS question asking parents whether they agree that individuals can overcome illness without seeing a doctor was collected by self-administered questionnaire from 2000 to 2005, the sample size is 20,228 who have not moved and 543 who have moved.

The provider supply variable was created by calculating the percentage of children within each primary sampling unit (PSU) who have a usual source of care. In MEPS, PSUs generally consist of one or more counties.[93] The propensity to use medical care variable is determined using the MEPS question that asks parents whether they agree or disagree that individuals can overcome illness without seeing a doctor.[93] When parents agree they are categorized as having a propensity to use medical care.

When the observable variables related to the unobserved variables are not correlated with the instrumental variable, which is the case here, other studies have

contended the instrument is appropriate.[90,103,104] Table 4.22 shows that 3 health-related measures are not significantly related to moving within the last year. The table also shows that measures representing the propensity to use medical care and provider supply are not significantly related to moving within the last year.

Gatekeeper Insurance Plan

Table 4.23 shows how having a usual source of care and medical care utilization varies by whether the child is covered by a gatekeeper insurance plan. Children who are covered by a gatekeeper insurance plan are very similar to children who are not covered by a gatekeeper insurance plan. More specifically, the percent of children who have a usual source of care, use ambulatory care, and use the ER/hospital are essentially equivalent between the two groups.

Table 4.23: Gatekeeper Insurance Plan, Usual Source of Care and Medical Care

	Gatekeeper	No Gatekeeper	Significance
Total	3,020	28,187	
Has a Usual Source of Care			
Weighted %	92.9%	93.1%	.881
SE	.0137	.37%	
Uses Ambulatory Care			
Weighted %	43.5%	43.6%	.976
SE	.0132	.47%	
Uses ER/hospital			
Weighted %	4.5%	3.7%	.120
SE	.0054	.15%	

Unlike the previously tested instrument, the strength of the correlation between having a gatekeeper insurance plan and having a usual source of care appears to be much weaker, with a correlation coefficient of .0143 at a significance level .0118 (data not shown). Having a gatekeeper is also more weekly related to the utilization measures. In addition, Table 4.24 shows the instrument may be correlated with some unobservable health-related variables in the error term because having a fair/poor health status and provider supply are correlated with having a gatekeeper insurance plan.

Table 4.24: Gatekeeper Insurance plan, Observable Indicators

	Gatekeeper	No Gatekeeper	Significance
Total	3,020	28,187	
Fair/poor health status			
Weighted %	6.6%	4.2%	.019
SE	.0117	.25%	
Has a disability			
Weighted %	1.0%	1.0%	.936
SE	.0029	.12%	
Presence of a chronic condition			
Weighted %	30.8%	28.0%	.133
SE	.0186	.61%	
Propensity to use medical care*			
Weighted %	80.3%	80.0%	.909
SE	.0229	.75%	
Provider supply			
Weighted Average	87.3%	86.7%	<.0001
SE	.0010	.10%	

* The MEPS question asking parents whether they agree that individuals can overcome illness without seeing a doctor was collected by self-administered questionnaire from 2000 to 2005, the sample size is 18,669 have a gatekeeper insurance plan and 2,162 do not have a gatekeeper insurance plan.

Overall, the bivariate analyses show that most of the predisposing, enabling and need variables have a significant relationship with either having a usual source of care or medical care utilization. The multivariate analyses show whether these relationships remain significant.

Secondly, the bivariate analyses show that the study conditions have vary different utilization patterns for ambulatory care and ER/hospital use, which needs to be taken into account when interpreting the findings from multivariate analyses that aggregate conditions.

Finally, the bivariate analyses show the proposed gatekeeper instrumental variable is not a good instrumental variable because it is not strongly correlated with having a usual source of care, and it is likely correlated with unobservable measures in the error term.

III. The Multivariate Analyses

The purpose of the multivariate analyses is to determine the independent effect of having a usual source of care on medical care utilization. These analyses take into account, or control for, the other predisposing, enabling, and need variables that are related to having a usual source of care and using medical care. The analyses are divided into three major sections to illustrate the key contributions the current study makes to the previous research conducted on this topic.

The first section shows the effect of taking into account reverse causality when examining the impact of having a usual source of care. This section distinguishes the results from a multivariate model for which the usual source of care variable represents what is known after or during the time the child has an episode of the illness from a multivariate model for which the usual source of care variable represents what is known before the child has an episode of the illness to a multivariate analysis. For these analyses, I use Stata's probit model and present the coefficients, standard errors, p-values, confidence intervals and marginal effects, while adjusting for the dataset's complex survey design. The unit of analysis is the child-condition, meaning each occurrence of the study condition for each child is a unique record, and children are in the analysis multiple times according to how may occurrences of the study conditions they experience. For the characteristics that vary across rounds (ex: age, insurance, etc.), I use the responses that were collected during the same round that the condition occurred.

The second section shows the effect of focusing on specific types of conditions when examining the impact of having a usual source of care. This section takes into account reverse causality and shows the results of separate multivariate models according to condition type. For these analyses, I use Stata's probit model and present the coefficients, standard errors, p-values, confidence intervals and marginal effects, while adjusting for the dataset's complex survey design. The unit of analysis is the child-condition, meaning each occurrence of the study condition for each child is a unique record, and children are in the analysis multiple times according to how may occurrences of the study conditions they experience. For the characteristics that vary across rounds

(ex: age, insurance, etc.), I use the responses that were collected during the same round that the condition occurred.

The third section shows the effect of taking into account selection bias. This section takes into account reverse causality and the different effects of condition types and shows the results of addressing selection bias by using an instrumental variable. For these analyses, I uses Stata's biprobit[7] model and present the coefficients, standard errors, p-values, confidence intervals and marginal effects, while adjusting for the dataset's complex survey design. The unit of analysis is the child-condition, meaning each occurrence of the study condition for each child is a unique record, and children are in the analysis multiple times according to how may occurrences of the study conditions they experience. For the characteristics that vary across rounds (ex: age, insurance, etc.), I use the responses that were collected during the same round that the condition occurred.

A. Taking into Account Reverse Causality

Table 4.25 shows the different impact having a usual source of care has on ambulatory care utilization depending on whether the information is recorded prior to the child having an episode of the condition or during or after the child has an episode of the condition.

Table 4.25: Impact of Having a Usual Source of Care on Ambulatory Care*

	Coeff	SE	Significance (p-value)	Confidence Interval	Marginal Effect dx/dy
USC Prior to Episode	0.260	.042	<.0001	.177-.343	.092
USC During/After Episode	0.349	.047	<.0001	.255-.442	.120

*Note: full models are in Appendix C

When reverse causality is taken into account the effect of having a usual source of care is smaller, as both the predicted probability and the marginal effect decreases slightly when you measure the presence of a usual source of care prior to the child having an episode of the condition.

Table 4.26 shows the different impact having a usual source of care has on ER/hospital use depending on whether the information is recording prior to the child

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[7] The biprobit command was selected over Stata's heckprob command because the Hausman test showed an intercept shift model was more appropriate than a separate sector model, meaning the coefficients for the confounding variables in the model act very similarly regardless of whether or not the child has a usual source of care. (See Appendix B)

having an episode of the condition or during or after the child has an episode of the condition.

Table 4.26: Impact of Having a Usual Source of Care on ER/Hospital Use*

	Coeff	SE	Significance (p-value)	Confidence Interval	Marginal Effect dx/dy
USC Prior to Episode	-0.143	.06	.022	-.265- -.021	-.0075
USC During/After Episode	-0.173	.06	.005	-.294- -.052	-.0093

*Note: full models are in Appendix C

Again, when reverse causality is taken into account the effect of having a usual source of care is smaller, as both the predicted probability and the marginal effect decreases slightly when you measure the presence of a usual source of care prior to the child having an episode of the condition.

Table 4.27 shows the different impact having a usual source of care has on ER/hospital use among children using ambulatory care depending on whether the information is recorded prior to the child having an episode of the condition or during or after the child has an episode of the condition.

Table 4.27: Impact of Having a Usual Source of Care on ER/Hospital Use Among Children Using Ambulatory Care*

	Coeff	SE	Significance (p-value)	Confidence Interval	Marginal Effect dx/dy
USC Prior to Episode	-0.035	-0.43	.666	-.265-169	-0.0019
USC During/After Episode	-0.057	-0.12	.631	-.142-.080	-0.0023

*Note: full models are in Appendix C

Again, when reverse causality is taken into account the effect of having a usual source of care is smaller, as both the predicted probability and the marginal effect decrease when you measure the presence of a usual source of care prior to the child having an episode of the condition.

B. Effects When Focusing on Specific Condition Types

Table 4.28 shows the impact of having a usual source of care on ambulatory care utilization depending on the type of condition the child has. Having a usual source of care is associated with whether a child receives ambulatory care when they have an acute condition not sensitive to ambulatory care and an ambulatory care sensitive (ACS) condition. However, for chronic conditions, the children who have a usual source of care appear to have similar utilization to children who do not have a usual source of care.

Table 4.28: Impact of Having a Usual Source of Care on Ambulatory Care Utilization*

Condition	Coefficient	SE	Significance (p-value)	Confidence Interval	Marginal Effect dx/dy
Acute Conditions	.359	.055	<.001	.251-.468	.118
ACS Conditions	.184	.063	.004	.059-.308	.067
Chronic Conditions	.036	.096	.711	-.153-.224	.014

*Note: full models are in Appendix D

Table 4.29 shows the different impact having a usual source of care has on ER/Hospital use depending on what type of condition the child has. Having a usual source of care does not appear to strongly impact whether a child uses the ER/Hospital when the types of conditions are looked at individually.

Table 4.29: Impact of Having a Usual Source of Care on ER/Hospital Use*

	Coefficient	SE	Significance (p-value)	Confidence Interval	Marginal Effect dx/dy
Acute Conditions	-.121	.092	.189	-.303-.060	-.003
ACS Conditions	-.158	.082	.053	-.319-.002	-.014
Chronic Conditions	-.169	.117	.147	-.398-.060	-.010

*Note: full models are in Appendix D

Table 4.30 shows the different impact having a usual source of care has on ER/Hospital use among children using ambulatory care depending on what type of condition the child has. Having a usual source of care appears to strongly impact whether a child uses the ER/Hospital when the types of conditions are looked at individually.

Table 4.30: Impact of Having a Usual Source of Care on ER/Hospital Use Among Children Using Ambulatory Care*

	Coefficient	SE	Significance (p-value)	Confidence Interval	Marginal Effect dx/dy
Acute Conditions	-.035	.231	.879	-.489-.419	-.001
ACS Conditions	-.024	.131	.855	-.282-.234	-.002
Chronic Conditions	-.103	.189	.584	-.474-.268	-.005

*Note: full models are in Appendix D

C. Taking into Account Selection Bias

Table 4.31 shows the different impact having a usual source of care has on ambulatory care utilization after taking into account selection bias depending on what type of condition the child has. Selection bias only needs to be accounted for when the correlation between the error terms (Rho) in estimating having a usual source of care and estimating utilizing care is significant.

Table 4.31: Impact of Having a Usual Source of Care on Ambulatory Care Utilization*

Condition	Coefficient	SE	Significance (p-value)	Confidence Interval	Marginal Effect dx/dy	Rho p-value
Acute Conditions	.914	.240	<.001	.442-1.385	.235	.031
ACS Conditions	.287	.340	.399	-.381-.955	.098	.748
Chronic Conditions	-.514	.536	.338	-.1566-	-.197	.304

*Note: full models are in Appendix E

Having a usual source of care appears to significantly impact whether a child receives ambulatory care when they have an acute condition not sensitive to ambulatory care. However, for ambulatory care sensitive (ACS) conditions and chronic conditions, selection bias does not seem to be an issue, so the results from Table 4.28 can be used.

Table 4.32 shows the different impact having a usual source of care has on ER/Hospital use after taking into account selection bias depending on what type of condition the child has. Since none of the models show a correlation between the error terms when estimating having a usual source of care and estimating using care, the results from Table 4.29 can be used.

Table 4.32: Impact of Having a Usual Source of Care on ER/Hospital Use*

Condition	Coefficient	SE	Significance (p-value)	Confidence Interval	Marginal Effect dx/dy	Rho p-value
Acute Conditions	-.332	.515	.519	-1.344-	-.011	.660
ACS Conditions	-.741	.373	.048	-1.474- -	-.102	.112
Chronic Conditions	.928	.578	.109	-207-	.021	.199

*Note: full models are in Appendix E

Table 4.33 shows the different impact having a usual source of care has on ER/Hospital use among children using ambulatory care after taking into account selection bias depending on what type of condition the child has. Having a usual source of care increases the likelihood that a child uses ER/Hospital when they have chronic conditions, but, for acute conditions not sensitive to ambulatory care and ambulatory care sensitive (ACS) conditions, selection bias does not seem to be an issue, so the results from Table 4.30 can be used.

Table 4.33: Impact of Having a Usual Source of Care on ER/Hospital Use Among Children

Condition	Coefficient	SE	Significance (p-value)	Confidence Interval	Marginal Effect dx/dy	Rho p-value
Acute Conditions	-.253	.888	.776	1.996-1.491	-.006	.795
ACS Conditions	-.254	.583	.663	-1.398-.689	-.020	.689
Chronic Conditions	1.278	31.5	<.001	.659-1.898	.021	.045

*Note: full models are in Appendix E

Overall, the multivariate models show the strength of the association that having a usual source of care has on medical utilization depends all three components examined in this study: 1) whether reverse causality is accounted for, 2) what type of condition the child has, and 3) whether selection bias is addressed.

Chapter 5: Discussion

I. Conclusions

A. Hypotheses I: Having a Usual Source of Care Increases the Likelihood of Ambulatory Care Utilization

Previous studies have shown children who have a usual source of care are more likely to use ambulatory care.[20-22,26,28] However, these studies fail to address the issues of selection bias and reverse causality, and none of these studies assess whether the effects vary according to the child's health condition.

The current study finds that once selection bias and reverse causality are taken into account, the association between having a usual source of care and increased ambulatory care utilization reported in previous studies is not experienced uniformly by children who have different types of health conditions. Rather, the findings from the current study suggest that the results seen in previous studies may be driven more by the large number of children who have acute conditions not sensitive to ambulatory care and or ambulatory care sensitive (ACS) conditions. This finding suggests that there may be a greater persistence to access care when a child has a chronic condition.

Specifically, the multivariate analyses show that for children who have study conditions that are acute conditions not sensitive to ambulatory care, such as colds and flu (Table 4.31) or ACS conditions, such as otitis media (Table 4.28), having a usual source of care increases the likelihood that a children obtains ambulatory care. However, for children who have chronic conditions, the differences in using ambulatory care are not significant. Table 5.1 compares the hypothesized relationship between having a usual source of care and using ambulatory care to the actual relationship seen in the multivariate analysis after taking into account selection bias.

Table 5.1 Relationships Between Having a Usual Source of Care and Ambulatory Care

Condition Type	Hypothesized Relationship	Actual Relationship
Acute conditions not sensitive to ambulatory care	+	+
Ambulatory care sensitive conditions	+	+
Chronic conditions	+	Not Significant

B. Hypothesis II: Having a Usual Source of Care Decreases the Likelihood of ER and Hospital Utilization for Children Having ACS Conditions

Previous studies examining the impact of having a usual source of care on ER visits and hospitalizations among children have found contradicting results. Four studies have found that having a usual source of care reduces the likelihood of using the ER or hospital.[23-25,27] However, these studies use study populations that drastically limit the generalization of their findings. Three other studies find having a usual source does not affect the likelihood of using the ER or hospital.[20,22,29,30] However, these studies fail to address the issue of reverse causality. In addition, none of these studies address selection bias or assess whether the effects vary according to the child's health condition.

In the current study, the multivariate analyses (Table 4.29) show that for children who have ACS conditions, such as otitis media, having a usual source of care decreases the likelihood that children utilize the ER or hospital. However, for children who have acute conditions not sensitive to ambulatory care and chronic conditions, the difference is not significant. Table 5.2 compares the hypothesized relationship between having a usual source of care and using ER/hospital care to the actual relationship seen in the multivariate analysis after taking into account selection bias.

Table 5.2 Relationships Between Having a Usual Source of Care and ER/Hospital Care

Condition Type	Hypothesized Relationship	Actual Relationship
Acute conditions not sensitive to ambulatory care	Not Significant	Not Significant
Ambulatory care sensitive conditions	-	-
Chronic conditions	Not Significant	Not Significant

These findings may indicate why there has been contradicting results across these previous studies. In the previous studies among the broader more generalizable populations, there may not be a high enough concentration of children with these ACS conditions to show a trend overall. In the previous studies that did find an impact on ER and hospital utilization, the study populations were among children who had at least 3 visits to the doctor during the study period. These study populations may have had higher concentrations of children with ACS conditions, which may be why they were able to show a significant impact.

C. **Hypothesis III: Having a Usual Source of Care Decreases the Likelihood of ER and Hospital Utilization for Children Having Chronic Conditions who use Ambulatory Care**

Previous studies of children have not focused on the relationships of having a usual source of care and using ambulatory care with ER/hospital use, but several studies contend that provider continuity is associated with more optimal health care.[49,76-85] The current study contends that having a usual source of care may suggest greater continuity and tests whether having a usual source of care when ambulatory care is obtained translates into a decreased likelihood of ER/hospital use when children have chronic conditions that likely benefit from ongoing, continuous, care.

The multivariate analyses (Table 4.33) indicates that for children who have chronic conditions and use ambulatory care, having a usual source of care increases the likelihood that children utilize the ER or hospital. For children who have acute conditions not sensitive to ambulatory care and ACS conditions, the difference is not significant (Table 4.30). Table 5.3 compares the hypothesized relationship between having a usual source of care among children who use ambulatory care and using ER/hospital care to the actual relationship seen in the multivariate analysis after taking into account selection bias.

Table 5.3 Relationships Between Having a Usual Source of Care and ER/Hospital Care Among Children Using Ambulatory Care

Condition Type	Hypothesized Relationship	Actual Relationship
Acute conditions not sensitive to ambulatory care	Not Significant	Not Significant
Ambulatory care sensitive conditions	Not Significant	Not Significant
Chronic conditions	-	+

This finding for chronic conditions is surprising as it is the opposite of what the study's theoretical model points to. One possible explanation is the small sample size of the group who has a chronic condition, uses ambulatory care, and lacks a usual source of care. Another explanation is that the instrumental variable of moving may work differently among this population. More specifically, children who have chronic

condition, move, use ambulatory care, and who find a usual source of care may be different than other children who move.

II. Limitations

There are several limitations to this study that impact the reliability, generalizability, and interpretation of the findings. One of the most critical limitations is the sample sizes. Even though the study combines nine years of data for a total of 31,207 child-condition observations, the majority of the individual study conditions have less than 5,000 records and two study conditions have less than 1,000 records. In addition, the proportion of children who lack a usual source of care is small (8.2%) and the proportion of children who use ER and hospital care is small (7.3%). These small sample sizes can result in unreliable findings.

Another limitation is that this study is not representative of the entire child population because it only includes children who have at least one occurrence of one of ten common childhood conditions. Although the only major demographic difference is that the study population is a lot younger than the general child population,[110] the effect of having a usual source of care for other condition-related care and preventive care may be very different. In addition, asthma was analyzed as both a chronic and ACS condition because it was defined by AHRQ and the literature as such. Further analyses, with larger sample sizes, would need to be done to determine the impact of having a usual source of each individual condition.

Another limitation is that this study can not determine the temporality of the services. Children who use ER/hospital care as well as ambulatory care could have received either type of care first. This limitation is particularly important when examining the findings related to hypothesis #3, for which the denominator population is made up children who use ambulatory care and the outcome measure is ER/hospital care. When testing this hypothesis, the assumption is made that the child uses ambulatory care first, and the continuity of care presumably received there when children have a usual source of care should result in a decreased likelihood that the child has an ER visit or inpatient stay. It is possible, however, that children could receive the care first in the ER or hospital and then be recommended for ambulatory care for follow-up. This limitation

reinforces the importance of examining the effect of having a usual source of care across all of the outcome measures for each condition type. If the hypothesis is true, the coefficient for having a usual source of care on ER/hospital care among children who use ambulatory care should only be negative for children who have chronic conditions because these are the conditions that should be affected by having a greater degree of continuity.

A final critical limitation is that only one instrumental variable was used. The bivariate analyses showed the gatekeeper instrumental variable was not a good instrument because it was not strongly associated with having a usual source of care and with was likely correlated with unobservable measures in the error term. As a results the study only used whether or not the child moved within the past year as an instrument. This limitation is of great concern because the number of children who moved was very small (N=671) and when this is applied to small sample sizes for lacking a usual source of care and having ER and hospital utilization, it's accuracy may be questionable.

III. Policy and Practice Implications

An increasing number of policies and resources have been aimed at ensuring children have a usual source of care. Specifically, the US Department of Health and Human Services, the Administration of Children and Families, the American Academy of Pediatrics, and the American Academy of Family Physicians now all have recommendations to increase the number of people who have a usual source of care.[2,3,4,5] And, at least three national reports now track the number of children who have a usual source of care, including Health U.S, the National Healthcare and Quality Report, and the National Survey of Children's Health.[11,12,13] In addition, the Maternal and Child Health Bureau and the American Academy of Pediatrics now award grants to promote and develop medical homes, a more specific type of usual source of care, for children.[15,16]

Although policy decisions should not be based on one research study, this paper suggests that having a usual source of care may not be as beneficial as initially thought for all children. Not all children need a usual source of care for the vast majority of transient illnesses they acquire. It may be worth re-assessing if and how efforts to promote usual source of care could be more targeted for children with different types of

health needs. In targeting efforts, leaders and policymakers need to be careful to separate the child from the condition. Most childhood conditions are acute and unpredictable, so it would be challenging to design policies targeted towards these conditions. However, chronic conditions, which stay with the child, could be used to target those children at greatest risk who might benefit most from having a usual source of care.

Most importantly, though, is that the findings from the current study show when evaluating these efforts, we need to be very careful not to assume the effects will be the same across children with varying types of health conditions. In addition, evaluations and research around having a usual source of care need to take into account study design issues that have been previously unaccounted for, including selection bias and reverse causality, as the current study shows that these issues can make a difference in estimating the impact of having a usual source of care.

IV. Summary

Overall, this study shows that when accounting for selection bias and reverse causality the effect of having a usual source of care varies according to the type of condition the child has. Having a usual source of care increases the likelihood of using ambulatory care for children who have acute conditions not sensitive to ambulatory care and ACS conditions. Having a usual source of care also decreases the likelihood of ER and hospital utilization for children who have ambulatory care sensitive conditions. Finally, having a usual source of care is related to an increase in ER and hospital utilization for children using ambulatory care.

The results suggest that the policies and funding aimed at ensuring *every* child has a usual source of care may benefit from being more targeted. In addition, future research estimating the impact of having a usual source of care needs to account for selection bias and reverse causality in their study designs.

Appendix A. Child Level Univariate Analyses

Table A.1: Conditions and Intervention and Outcome Measures at the Child Level

	N	Percent	Weighted Percent	Weighted SE
Usual Source of Care				
0=No usual source of care	1,613	9.9	8.2	0.0038
1=Has a usual source of care	14,653	90.1	92.8	0.0038
Study Conditions				
1= cold	6,458	39.7	38.8	0.0059
2=flu	2,392	14.7	14.2	0.0050
3=sore throat	1,841	11.3	12.6	0.0038
4=otitis media	1,842	11.3	12.1	0.0033
5=pneumonia	349	2.1	0.2	0.0016
6=urinary tract infection	337	2.1	2.2	0.0014
7=gastroenteritis	3,406	20.9	21.2	0.0047
8=asthma	583	3.6	3.2	0.0018
9=allergies	1,237	7.6	7.7	0.0029
10=chronic sinusitis	767	4.7	5.9	0.0028
Ambulatory Care Visits				
0= Did not receive ambulatory care	7,558	46.5	45.4	0.0057
1=Received ambulatory care	8,708	53.5	54.6	0.0057
Hospital Stays or ER Visits				
0= Did not have an hospital stay or ER visit	15,074	92.7	93.5	0.0025
1=Had an hospital stay or ER visit	1,192	7.3	6.5	0.0025

Table A.2: Predisposing Characteristics at the Child Level

	N	Percent	Weighted Percent	Weighted SE
Sex				
0=Female	8,073	49.6	49.6	0.0048
1=Male	8,193	50.4	50.4	0.0048
Age				
1=0-5 years old	7,196	44.2	44.6	0.0050
2=6-12 years old	6,648	40.9	37.7	0.0049
3=13-17 years old	2,422	14.9	15.7	0.0037
Race/Ethnicity				
1=Non-Hispanic White	8,411	51.7	68.7	0.0082
2=Non-Hispanic Black	2,195	13.5	10.8	0.0053
3=Hispanic	4,891	30.1	15.6	0.0069
4=Non-Hispanic Other	769	4.7	4.9	0.0032
Family Status				
1=Married Parents	10,325	63.5	68.5	0.0061
2=Single Parent	3,714	22.8	19.8	0.0048
3=Other	2,227	13.7	1.2	0.0042
Language				
0=Non-English	2,487	15.3	6.6	0.0038
1=English	13,779	84.7	93.5	0.0038

Table A.3: Enabling Characteristics at the Child Level

	N	Percent	Weighted Percent	Weighted SE
Insurance				
1= Private	9,090	55.9	67.8	0.0070
2=Public	5,287	32.5	22.5	0.0058
3=Uninsured	1,889	11.6	9.8	0.0038
Income				
1= Less than 100% FPL	3,894	23.9	15.9	0.0054
2=100-199% FPL	4,110	25.3	20.9	0.0055
3=200-399% FPL	4,947	30.4	34.5	0.0065
4= 400%+ FPL	3,315	20.4	28.7	0.0071
Highest Household Education				
1=Less than High School	2,696	16.6	9.5	0.0035
2=High School Grad	4,834	29.7	26.7	0.0059
3=More than High School	8,736	53.7	63.8	0.0069
Region				
1=Northeast	2,447	15.0	17.8	0.0121
2=Midwest	3,461	21.3	25.4	0.0155
3=South	5,677	34.9	32.2	0.0159
4=West	4,681	28.8	24.8	0.0174
MSA				
0=Does not live in a MSA	3,354	20.6	18.8	0.0112
1=Lives in a MSA	12,912	79.4	81.2	0.0112

Table A.4: Need Characteristics at the Child Level

	N	Percent	Weighted Percent	Weighted SE
Health Status				
1=Excellent or very good	12,927	79.5	82.0	0.0048
2=Good health	2,988	18.4	15.5	0.0044
3=Fair or poor	351	2.2	2.5	0.0015
Disability				
0= No disabilities	16,050	98.7	99.0	0.0010
1= Has a disability	216	1.3	1.0	0.0010
Chronic Condition				
0=No Chronic conditions	12,165	74.8	73.6	0.0046
1=Chronic condition	4,101	25.2	26.4	0.0046

Table A.5: Instrumental Variables at the Child Level

	N	Percent	Weighted Percent	Weighted SE
Has the Child Moved				
0=Did not move	15,950	98.1	98.3	0.0013
1=Moved within past year	316	1.9	1.6	0.0013
Does the Child have a Gatekeeper				
0=Does not have gatekeeper plan	14,888	91.5	90.9	0.0041
1=Has gatekeeper plan	1,378	8.5	9.1	0.0041

The Hausman test was used to determine whether the predisposing, enabling, and need variables affect the outcome measures differently according to whether or not the child has a usual source of care. When these variables affect the outcome measures differently, a separate-sector or heterogeneous treatment effects model is used. Otherwise, a intercept-shift or homogeneous treatment effects model is used. The table below shows the results of running two models. The first model estimates the coefficients when having a usual source of care is the affirmative response. The second model estimates the coefficients when lacking a usual source of care is the affirmative response. Since the results are very similar, an intercept-shift model is used.

Table B.1: Results of the Hausman Test to Determine Multivariate Model Used

	Model 1: Having USC = 1				Model 2: Lacking USC = 1			
	Coef	SE	95% CI		Coef	SE	95% CI	
Male	-0.039	0.015	-0.069	-0.009	-0.061	0.054	-0.166	0.045
6-12 years old	-0.272	0.020	-0.311	-0.232	-0.205	0.075	-0.351	-0.059
13-17 years old	-0.464	0.029	-0.521	-0.408	-0.388	0.094	-0.571	-0.205
Non-Hispanic Black	-0.226	0.027	-0.278	-0.174	-0.387	0.098	-0.579	-0.196
Hispanic	-0.013	0.024	-0.060	0.033	-0.049	0.082	-0.209	0.111
Non-Hispanic Other	-0.153	0.038	-0.227	-0.079	0.005	0.140	-0.269	0.279
Single Parent	-0.069	0.022	-0.111	-0.026	-0.162	0.070	-0.298	-0.026
Other	-0.154	0.025	-0.203	-0.104	-0.236	0.076	-0.386	-0.087
English	-0.182	0.030	-0.242	-0.123	-0.117	0.082	-0.277	0.043
Public Insurance	0.016	0.022	-0.028	0.060	0.261	0.073	0.119	0.403
Uninsured	-0.193	0.043	-0.278	-0.109	-0.209	0.106	-0.416	-0.002
Less than 100% FPL	-0.098	0.031	-0.160	-0.036	-0.022	0.119	-0.255	0.211
100-199% FPL	-0.126	0.027	-0.180	-0.073	-0.024	0.113	-0.245	0.198
200-399% FPL	-0.039	0.021	-0.081	0.003	-0.056	0.106	-0.265	0.152
Less than High School	-0.041	0.029	-0.098	0.015	0.005	0.079	-0.150	0.161
High School Grad	-0.030	0.019	-0.068	0.007	-0.039	0.067	-0.170	0.092
Midwest	-0.082	0.026	-0.132	-0.033	0.005	0.125	-0.240	0.249
South	0.115	0.025	0.066	0.165	0.115	0.116	-0.112	0.342
West	-0.084	0.026	-0.135	-0.033	-0.046	0.115	-0.272	0.180
MSA	-0.069	0.020	-0.107	-0.030	-0.004	0.074	-0.149	0.141
Good health	0.113	0.018	0.078	0.149	0.124	0.062	0.003	0.246
Fair or poor	0.103	0.034	0.036	0.171	0.297	0.106	0.090	0.505
Has a disability	0.020	0.066	-0.110	0.150	0.099	0.230	-0.351	0.549
Has a chronic condition	0.048	0.020	0.008	0.088	0.196	0.086	0.027	0.364

Appendix C: Full Models Taking into Account Reverse Causality

Table C.1: Effects on Ambulatory Care Utilization Taking into Account Reverse Causality

	USC Recorded Prior to Episode						USC Recorded During/After to Episode					
	Coef	SE	P	95% CI		dx/dy	Coef	SE	P	95% CI		dx/dy
Usual Source of Care	0.260	0.042	0.000	0.177	0.343	0.092	0.349	0.047	0.000	0.255	0.442	0.121
Male	-0.063	0.019	0.001	-0.101	-0.026	-0.023	-0.065	0.019	0.001	-0.101	-0.028	-0.024
6-12 years old	-0.303	0.022	0.000	-0.346	-0.260	-0.105	-0.304	0.022	0.000	-0.348	-0.261	-0.105
13-17 years old	-0.501	0.029	0.000	-0.558	-0.445	-0.193	-0.502	0.029	0.000	-0.559	-0.445	-0.192
Non-Hispanic Black	-0.259	0.036	0.000	-0.331	-0.188	-0.091	-0.255	0.037	0.000	-0.327	-0.182	-0.089
Hispanic	-0.057	0.031	0.070	-0.118	0.005	-0.021	-0.055	0.031	0.078	-0.117	0.006	-0.020
Non-Hispanic Other	-0.145	0.053	0.006	-0.250	-0.041	-0.052	-0.135	0.053	0.012	-0.240	-0.030	-0.048
Single Parent	-0.059	0.030	0.051	-0.119	0.000	-0.022	-0.052	0.030	0.086	-0.111	0.007	-0.019
Other	-0.175	0.034	0.000	-0.241	-0.109	-0.063	-0.173	0.034	0.000	-0.240	-0.107	-0.063
English	-0.167	0.047	0.000	-0.260	-0.074	-0.063	-0.168	0.048	0.001	-0.262	-0.073	-0.063
Public Insurance	0.023	0.029	0.425	-0.034	0.081	0.009	0.021	0.030	0.494	-0.038	0.080	0.008
Uninsured	-0.246	0.042	0.000	-0.328	-0.164	-0.086	-0.237	0.042	0.000	-0.319	-0.155	-0.083
Less than 100% FPL	-0.094	0.044	0.034	-0.181	-0.007	-0.034	-0.090	0.045	0.045	-0.178	-0.002	-0.033
100-199% FPL	-0.122	0.035	0.001	-0.192	-0.053	-0.044	-0.120	0.036	0.001	-0.190	-0.050	-0.043
200-399% FPL	-0.035	0.030	0.241	-0.093	0.024	-0.013	-0.032	0.030	0.275	-0.091	0.026	-0.012
Less than High School	-0.065	0.039	0.093	-0.140	0.011	-0.024	-0.071	0.039	0.065	-0.147	0.005	-0.026
High School Grad	-0.048	0.026	0.065	-0.100	0.003	-0.018	-0.051	0.026	0.052	-0.103	0.001	-0.019
Midwest	-0.116	0.036	0.001	-0.187	-0.045	-0.042	-0.114	0.036	0.001	-0.184	-0.044	-0.041
South	0.063	0.036	0.081	-0.008	0.134	0.023	0.063	0.036	0.079	-0.007	0.133	0.023
West	-0.154	0.037	0.000	-0.227	-0.081	-0.055	-0.154	0.037	0.000	-0.226	-0.081	-0.055
MSA	-0.048	0.030	0.106	-0.106	0.010	-0.018	-0.051	0.029	0.083	-0.108	0.007	-0.019
Good health	0.119	0.024	0.000	0.073	0.165	0.045	0.119	0.024	0.000	0.073	0.166	0.044
Fair or poor	0.136	0.051	0.008	0.036	0.236	0.051	0.137	0.051	0.007	0.037	0.237	0.051
Has a disability	0.113	0.127	0.375	-0.136	0.361	0.042	0.115	0.126	0.363	-0.133	0.362	0.043
Has a chronic condition	0.059	0.024	0.014	0.012	0.106	0.022	0.062	0.024	0.010	0.015	0.109	0.023

Table C.2: Effects on ER/Hospital Utilization Taking into Account Reverse Causality

	USC Recorded Prior to Episode					USC Recorded During/After to Episode				
	Coef	SE	P	95% CI		dx/dy	Coef	SE	P	95% CI		dx/dy
Usual Source of Care	-0.143	0.062	0.022	-0.266	-0.021	-0.007	-0.173	0.061	0.005	-0.294	-0.052	-0.009
Male	0.015	0.035	0.674	-0.054	0.083	0.001	0.016	0.035	0.655	-0.053	0.084	0.001
6-12 years old	-0.331	0.036	0.000	-0.402	-0.259	-0.012	-0.329	0.036	0.000	-0.400	-0.258	-0.012
13-17 years old	-0.375	0.050	0.000	-0.474	-0.276	-0.023	-0.373	0.050	0.000	-0.472	-0.275	-0.023
Non-Hispanic Black	0.204	0.056	0.000	0.094	0.313	0.011	0.200	0.056	0.000	0.090	0.310	0.011
Hispanic	0.071	0.055	0.196	-0.037	0.180	0.004	0.070	0.055	0.206	-0.038	0.178	0.004
Non-Hispanic Other	0.121	0.092	0.190	-0.060	0.302	0.006	0.109	0.091	0.232	-0.070	0.289	0.006
Single Parent	0.110	0.048	0.022	0.016	0.204	0.006	0.106	0.048	0.028	0.011	0.201	0.006
Other	0.180	0.053	0.001	0.076	0.285	0.009	0.181	0.053	0.001	0.076	0.285	0.009
English	0.099	0.078	0.208	-0.055	0.253	0.004	0.097	0.080	0.227	-0.061	0.255	0.004
Public Insurance	0.096	0.050	0.057	-0.003	0.195	0.005	0.098	0.050	0.052	-0.001	0.197	0.005
Uninsured	-0.003	0.068	0.969	-0.136	0.130	0.000	-0.008	0.067	0.908	-0.139	0.124	0.000
Less than 100% FPL	0.227	0.068	0.001	0.093	0.360	0.013	0.225	0.068	0.001	0.091	0.358	0.013
100-199% FPL	0.205	0.063	0.001	0.081	0.329	0.012	0.205	0.063	0.001	0.082	0.329	0.012
200-399% FPL	0.153	0.056	0.006	0.043	0.263	0.008	0.151	0.056	0.007	0.042	0.261	0.008
Less than High School	0.126	0.060	0.034	0.009	0.243	0.007	0.127	0.060	0.033	0.010	0.244	0.007
High School Grad	0.139	0.042	0.001	0.057	0.220	0.007	0.140	0.042	0.001	0.058	0.221	0.007
Midwest	0.091	0.057	0.112	-0.021	0.204	0.005	0.089	0.057	0.124	-0.024	0.201	0.005
South	0.176	0.050	0.000	0.078	0.274	0.009	0.176	0.050	0.000	0.077	0.275	0.009
West	-0.022	0.058	0.705	-0.136	0.092	-0.001	-0.022	0.058	0.701	-0.137	0.092	-0.001
MSA	-0.065	0.042	0.121	-0.148	0.017	-0.003	-0.063	0.042	0.133	-0.145	0.019	-0.003
Good health	0.082	0.041	0.045	0.002	0.161	0.004	0.082	0.041	0.046	0.001	0.162	0.004
Fair or poor	0.327	0.069	0.000	0.191	0.462	0.021	0.326	0.069	0.000	0.191	0.462	0.021
Has a disability	0.184	0.129	0.153	-0.069	0.437	0.010	0.180	0.128	0.158	-0.070	0.430	0.010
Has a chronic condition	0.084	0.037	0.023	0.011	0.156	0.004	0.080	0.037	0.029	0.008	0.152	0.004

Table C.3: Effects on ER/Hospital Utilization Among Children Using Ambulatory Care Taking into Account Reverse Causality

	USC Recorded Prior to Episode						USC Recorded During/After to Episode					
	Coef	SE	P	95% CI		dx/dy	Coef	SE	P	95% CI		dx/dy
Usual Source of Care	-0.048	0.111	-0.430	0.666	-0.266	0.170	-0.058	0.121	-0.480	0.631	-0.295	0.179
Male	-0.031	0.057	-0.540	0.588	-0.142	0.081	-0.031	0.057	-0.540	0.590	-0.142	0.081
6-12 years old	-0.278	0.066	-4.190	0.000	-0.409	-0.148	-0.277	0.066	-4.180	0.000	-0.407	-0.147
13-17 years old	-0.243	0.078	-3.110	0.002	-0.396	-0.090	-0.242	0.078	-3.110	0.002	-0.395	-0.089
Non-Hispanic Black	0.104	0.093	1.120	0.264	-0.079	0.288	0.102	0.094	1.090	0.274	-0.081	0.286
Hispanic	-0.038	0.090	-0.420	0.677	-0.214	0.139	-0.038	0.090	-0.420	0.676	-0.214	0.139
Non-Hispanic Other	0.026	0.138	0.190	0.853	-0.245	0.296	0.023	0.138	0.170	0.866	-0.247	0.293
Single Parent	0.046	0.083	0.550	0.580	-0.117	0.210	0.045	0.083	0.540	0.589	-0.119	0.209
Other	0.120	0.095	1.270	0.206	-0.066	0.307	0.121	0.095	1.270	0.204	-0.066	0.308
English	0.189	0.106	1.780	0.075	-0.019	0.398	0.191	0.106	1.790	0.074	-0.018	0.400
Public Insurance	0.085	0.083	1.030	0.305	-0.078	0.247	0.085	0.082	1.040	0.300	-0.076	0.247
Uninsured	-0.006	0.125	-0.050	0.962	-0.251	0.239	-0.005	0.125	-0.040	0.967	-0.250	0.240
Less than 100% FPL	0.271	0.108	2.500	0.013	0.059	0.484	0.271	0.109	2.490	0.013	0.058	0.484
100-199% FPL	0.225	0.098	2.290	0.022	0.032	0.417	0.225	0.098	2.280	0.023	0.032	0.418
200-399% FPL	0.180	0.077	2.330	0.020	0.028	0.331	0.179	0.077	2.320	0.021	0.027	0.331
Less than High School	0.150	0.092	1.630	0.103	-0.030	0.330	0.151	0.093	1.620	0.105	-0.032	0.334
High School Grad	0.143	0.067	2.130	0.033	0.011	0.274	0.143	0.067	2.140	0.033	0.012	0.275
Midwest	0.152	0.092	1.660	0.098	-0.028	0.331	0.150	0.092	1.640	0.102	-0.030	0.330
South	0.216	0.080	2.700	0.007	0.059	0.373	0.216	0.080	2.690	0.007	0.059	0.373
West	0.059	0.103	0.570	0.570	-0.144	0.261	0.059	0.103	0.570	0.569	-0.144	0.262
MSA	0.044	0.065	0.680	0.500	-0.084	0.173	0.045	0.066	0.690	0.492	-0.084	0.174
Good health	0.198	0.062	3.170	0.002	0.075	0.320	0.198	0.062	3.180	0.002	0.076	0.320
Fair or poor	0.629	0.097	6.510	0.000	0.439	0.819	0.629	0.097	6.520	0.000	0.440	0.819
Has a disability	0.056	0.179	0.310	0.755	-0.296	0.408	0.056	0.179	0.310	0.753	-0.296	0.409
Has a chronic condition	0.066	0.064	1.040	0.299	-0.059	0.191	0.066	0.063	1.040	0.301	-0.059	0.190

Appendix D: Full Models Showing Effects of Focusing on Specific Condition Types

Table D.1: Ambulatory Care Utilization, by Condition Type

	Acute Conditions					ACS Conditions					Chronic Conditions				
	Coef	P	95% CI		dx/dy	Coef	P	95% CI		dx/dy	Coef	P	95% CI		dx/dy
Usual Source of Care	0.359	0.000	0.251	0.468	0.118	0.184	0.004	0.059	0.308	0.067	0.036	0.711	-0.153	0.224	0.014
Male	-0.028	0.272	-0.077	0.022	-0.01	-0.098	0.001	-0.157	-0.038	-0.037	-0.091	0.056	-0.184	0.002	-0.036
6-12 years old	-0.27	0.000	-0.33	-0.21	-0.089	-0.349	0.000	-0.411	-0.287	-0.122	-0.174	0.002	-0.284	-0.063	-0.068
13-17 years old	-0.488	0.000	-0.566	-0.41	-0.182	-0.547	0.000	-0.638	-0.457	-0.213	-0.311	0.000	-0.437	-0.185	-0.124
Non-Hispanic Black	-0.246	0.000	-0.343	-0.149	-0.082	-0.249	0.000	-0.349	-0.149	-0.09	-0.327	0.000	-0.49	-0.164	-0.126
Hispanic	-0.105	0.014	-0.189	-0.021	-0.036	-0.003	0.942	-0.086	0.08	-0.001	-0.06	0.368	-0.191	0.071	-0.024
Non-Hispanic Other	-0.223	0.001	-0.35	-0.095	-0.074	-0.021	0.779	-0.17	0.128	-0.008	-0.241	0.029	-0.457	-0.025	-0.093
Single Parent	-0.078	0.061	-0.159	0.004	-0.027	-0.061	0.182	-0.15	0.029	-0.023	-0.004	0.947	-0.131	0.123	-0.002
Other	-0.144	0.002	-0.233	-0.054	-0.05	-0.187	0.000	-0.29	-0.085	-0.069	-0.13	0.088	-0.28	0.019	-0.051
English	-0.144	0.011	-0.255	-0.033	-0.052	-0.246	0.002	-0.397	-0.094	-0.095	-0.199	0.025	-0.373	-0.025	-0.079
Public Insurance	0.127	0.002	0.046	0.208	0.046	-0.035	0.405	-0.117	0.047	-0.013	-0.177	0.005	-0.3	-0.053	-0.069
Uninsured	-0.223	0.000	-0.333	-0.113	-0.074	-0.202	0.001	-0.32	-0.084	-0.073	-0.218	0.035	-0.42	-0.015	-0.085
< 100% FPL	-0.112	0.076	-0.237	0.012	-0.038	-0.087	0.133	-0.2	0.026	-0.032	-0.065	0.475	-0.242	0.113	-0.025
100-199% FPL	-0.16	0.002	-0.26	-0.06	-0.054	-0.051	0.286	-0.146	0.043	-0.019	-0.181	0.022	-0.336	-0.027	-0.071
200-399% FPL	-0.027	0.519	-0.109	0.055	-0.009	0.000	0.999	-0.08	0.08	0.000	-0.103	0.11	-0.229	0.023	-0.041
< High School	-0.042	0.408	-0.143	0.058	-0.015	-0.063	0.261	-0.172	0.047	-0.023	-0.035	0.636	-0.179	0.109	-0.014
High School Grad	-0.029	0.436	-0.102	0.044	-0.01	-0.062	0.084	-0.133	0.008	-0.023	-0.079	0.131	-0.182	0.024	-0.031
Midwest	-0.183	0.000	-0.285	-0.081	-0.062	-0.105	0.04	-0.206	-0.005	-0.039	0.04	0.614	-0.117	0.198	0.016
South	0.063	0.193	-0.032	0.159	0.022	0.04	0.41	-0.055	0.136	0.015	0.022	0.761	-0.122	0.167	0.009
West	-0.236	0.000	-0.339	-0.133	-0.079	-0.077	0.138	-0.18	0.025	-0.029	0.063	0.455	-0.103	0.229	0.025
MSA	-0.079	0.054	-0.159	0.001	-0.028	0.027	0.534	-0.058	0.112	0.01	-0.148	0.01	-0.261	-0.036	-0.059
Good health	0.11	0.002	0.042	0.179	0.039	0.118	0.001	0.047	0.189	0.045	0.106	0.052	-0.001	0.213	0.042
Fair or poor	0.051	0.498	-0.097	0.2	0.018	0.189	0.003	0.063	0.316	0.073	0.076	0.397	-0.1	0.251	0.03
Disability	-0.007	0.961	-0.27	0.257	-0.002	0.294	0.106	-0.062	0.65	0.114	-0.051	0.769	-0.391	0.289	-0.02
Chronic condition	0.072	0.035	0.005	0.14	0.025	0.054	0.116	-0.013	0.121	0.02	-0.02	0.7	-0.125	0.084	-0.008

Table D.2: ER/Hospital Utilization, by Condition Type

	Acute Conditions					ACS Conditions					Chronic Conditions				
	Coef	P	95% CI		dx/dy	Coef	P	95% CI		dx/dy	Coef	P	95% CI		dx/dy
Usual Source of Care	-0.121	0.189	-0.303	0.06	-0.003	-0.158	0.053	-0.319	0.002	-0.014	-0.169	0.147	-0.398	0.06	-0.01
Male	0.064	0.289	-0.055	0.183	0.002	0.019	0.65	-0.064	0.103	0.002	-0.035	0.653	-0.187	0.117	-0.002
6-12 years old	-0.231	0.000	-0.355	-0.106	-0.004	-0.3	0.000	-0.395	-0.205	-0.02	-0.348	0.000	-0.537	-0.16	-0.014
13-17 years old	-0.253	0.004	-0.426	-0.08	-0.007	-0.361	0.000	-0.484	-0.237	-0.037	-0.365	0.000	-0.568	-0.161	-0.026
Non-Hispanic Black	0.205	0.019	0.034	0.377	0.006	0.264	0.000	0.118	0.41	0.026	0.352	0.002	0.133	0.571	0.025
Hispanic	0.104	0.275	-0.083	0.292	0.003	0.069	0.315	-0.065	0.202	0.006	-0.019	0.866	-0.235	0.198	-0.001
Non-Hispanic Other	0.071	0.634	-0.222	0.363	0.002	0.199	0.081	-0.024	0.423	0.019	0.212	0.261	-0.158	0.583	0.014
Single Parent	0.052	0.495	-0.098	0.203	0.001	0.149	0.015	0.028	0.269	0.014	0.08	0.465	-0.135	0.295	0.005
Other	0.209	0.016	0.04	0.379	0.005	0.197	0.002	0.07	0.324	0.017	0.138	0.269	-0.107	0.383	0.008
English	0.294	0.021	0.045	0.543	0.005	-0.077	0.447	-0.277	0.122	-0.007	-0.088	0.582	-0.402	0.226	-0.005
Public Insurance	0.143	0.077	-0.015	0.301	0.004	0.103	0.109	-0.023	0.23	0.009	0.013	0.907	-0.208	0.234	0.001
Uninsured	0.125	0.284	-0.104	0.355	0.003	-0.037	0.673	-0.207	0.133	-0.003	-0.035	0.806	-0.318	0.247	-0.002
< 100% FPL	0.207	0.099	-0.039	0.454	0.006	0.211	0.014	0.042	0.38	0.02	0.291	0.067	-0.02	0.602	0.021
100-199% FPL	0.25	0.027	0.028	0.471	0.008	0.167	0.031	0.015	0.318	0.015	0.097	0.509	-0.191	0.385	0.006
200-399% FPL	0.136	0.198	-0.071	0.344	0.004	0.153	0.018	0.027	0.28	0.014	0.091	0.461	-0.152	0.334	0.005
< High School	0.251	0.014	0.05	0.452	0.008	0.109	0.162	-0.044	0.262	0.01	0.006	0.962	-0.251	0.264	0.000
High School Grad	0.184	0.014	0.038	0.33	0.005	0.128	0.012	0.029	0.228	0.011	0.126	0.184	-0.06	0.313	0.007
Midwest	0.252	0.013	0.053	0.45	0.007	0.063	0.369	-0.075	0.201	0.005	-0.002	0.99	-0.262	0.258	0.000
South	0.254	0.009	0.064	0.443	0.007	0.174	0.006	0.051	0.298	0.016	0.028	0.813	-0.205	0.261	0.002
West	0.152	0.119	-0.039	0.343	0.004	-0.064	0.385	-0.207	0.08	-0.005	0.082	0.573	-0.204	0.369	0.005
MSA	-0.149	0.045	-0.295	-0.003	-0.004	-0.039	0.472	-0.145	0.067	-0.003	0.103	0.333	-0.106	0.313	0.006
Good health	-0.012	0.857	-0.148	0.123	0.000	0.061	0.216	-0.036	0.159	0.005	0.256	0.01	0.061	0.452	0.017
Fair or poor	0.065	0.589	-0.17	0.299	0.002	0.31	0.000	0.144	0.476	0.032	0.402	0.000	0.178	0.627	0.031
Disability	0.314	0.058	-0.011	0.639	0.011	0.096	0.569	-0.236	0.429	0.009	0.17	0.565	-0.41	0.75	0.011
Chronic condition	0.126	0.039	0.007	0.246	0.003	0.112	0.023	0.015	0.209	0.009	-0.049	0.562	-0.216	0.117	-0.003

Table D.3: ER/Hospital Utilization Among Children Using Ambulatory Care, by Condition Type

	Acute Conditions					ACS Conditions					Chronic Conditions				
	Coef	P	95% CI		dx/dy	Coef	P	95% CI		dx/dy	Coef	P	95% CI		dx/dy
Usual Source of Care	-0.035	0.879	-0.489	0.419	-0.001	-0.024	0.855	-0.282	0.234	-0.002	-0.103	0.584	-0.474	0.268	-0.005
Male	-0.053	0.592	-0.249	0.142	-0.001	-0.011	0.87	-0.143	0.121	-0.001	-0.053	0.651	-0.283	0.177	-0.002
6-12 years old	-0.196	0.112	-0.438	0.046	-0.003	-0.212	0.011	-0.376	-0.049	-0.012	-0.402	0.003	-0.666	-0.138	-0.013
13-17 years old	-0.112	0.443	-0.397	0.174	-0.002	-0.232	0.026	-0.436	-0.029	-0.018	-0.385	0.016	-0.698	-0.073	-0.023
Non-Hispanic Black	0.132	0.379	-0.162	0.426	0.003	0.14	0.23	-0.089	0.37	0.01	-0.028	0.864	-0.345	0.29	-0.001
Hispanic	-0.247	0.099	-0.54	0.047	-0.003	0.023	0.839	-0.197	0.242	0.002	-0.164	0.342	-0.503	0.175	-0.007
Non-Hispanic Other	-0.099	0.702	-0.608	0.41	-0.001	0.081	0.643	-0.264	0.426	0.006	-0.19	0.422	-0.655	0.274	-0.007
Single Parent	-0.065	0.55	-0.277	0.148	-0.001	0.101	0.332	-0.103	0.305	0.007	-0.058	0.749	-0.41	0.295	-0.003
Other	0.033	0.837	-0.281	0.347	0.001	0.171	0.136	-0.054	0.397	0.012	0.225	0.23	-0.143	0.594	0.011
English	0.348	0.106	-0.074	0.769	0.004	0.092	0.467	-0.157	0.341	0.006	0.076	0.741	-0.378	0.531	0.003
Public Insurance	0.302	0.058	-0.011	0.614	0.007	0.053	0.604	-0.147	0.253	0.004	-0.012	0.943	-0.342	0.318	-0.001
Uninsured	0.343	0.11	-0.078	0.764	0.009	-0.09	0.512	-0.358	0.179	-0.005	-0.175	0.462	-0.643	0.293	-0.007
< 100% FPL	0.399	0.049	0.002	0.797	0.011	0.143	0.276	-0.115	0.401	0.011	0.481	0.033	0.04	0.922	0.034
100-199% FPL	0.224	0.254	-0.161	0.609	0.005	0.156	0.184	-0.074	0.387	0.012	0.264	0.213	-0.151	0.679	0.015
200-399% FPL	0.256	0.109	-0.057	0.57	0.005	0.116	0.204	-0.063	0.296	0.008	0.06	0.747	-0.306	0.427	0.003
< High School	0.266	0.146	-0.093	0.624	0.006	0.124	0.318	-0.12	0.367	0.009	0.203	0.242	-0.137	0.542	0.011
High School Grad	0.113	0.309	-0.105	0.33	0.002	0.137	0.099	-0.026	0.301	0.01	0.278	0.04	0.013	0.543	0.015
Midwest	0.307	0.072	-0.028	0.641	0.007	0.139	0.206	-0.077	0.355	0.01	0.071	0.71	-0.303	0.445	0.003
South	0.2	0.216	-0.117	0.516	0.004	0.262	0.01	0.062	0.463	0.02	0.058	0.727	-0.266	0.382	0.003
West	-0.022	0.901	-0.373	0.329	0.000	0.105	0.42	-0.15	0.36	0.007	0.066	0.765	-0.366	0.497	0.003
MSA	-0.044	0.738	-0.304	0.216	-0.001	0.034	0.684	-0.13	0.197	0.002	0.308	0.054	-0.006	0.621	0.014
Good health	0.174	0.14	-0.057	0.404	0.003	0.138	0.078	-0.016	0.291	0.01	0.367	0.009	0.093	0.641	0.022
Fair or poor	0.247	0.212	-0.142	0.636	0.005	0.595	0.000	0.37	0.82	0.063	0.603	0.000	0.29	0.916	0.048
Disability	0.188	0.505	-0.365	0.741	0.004	-0.103	0.652	-0.552	0.346	-0.006	0.585	0.147	-0.206	1.376	0.048
Chronic condition	0.115	0.279	-0.093	0.322	0.002	0.082	0.307	-0.075	0.239	0.005	-0.047	0.71	-0.293	0.2	-0.002

Appendix E: Full Models Addressing Selection Bias

Table E.1: Ambulatory Care Utilization, by Condition Type

	Acute Conditions					ACS Conditions					Chronic Conditions				
	Coef	P	95% CI		dx/dy	Coef	P	95% CI		dx/dy	Coef	P	95% CI		dx/dy
Usual Source of Care	0.914	0.000	0.442	1.385	0.235	0.287	0.399	-0.381	0.955	0.098	-0.514	0.338	-1.566	0.539	-0.197
Male	-0.025	0.309	-0.074	0.024	-0.008	-0.097	0.001	-0.157	-0.038	-0.036	-0.102	0.036	-0.198	-0.007	-0.043
6-12 years old	-0.247	0.000	-0.312	-0.182	-0.087	-0.346	0.000	-0.410	-0.282	-0.124	-0.202	0.002	-0.328	-0.076	-0.092
13-17 years old	-0.442	0.000	-0.533	-0.351	-0.176	-0.541	0.000	-0.638	-0.444	-0.220	-0.340	0.000	-0.479	-0.201	-0.140
Non-Hispanic Black	-0.244	0.000	-0.338	-0.149	-0.073	-0.250	0.000	-0.350	-0.150	-0.084	-0.319	0.000	-0.485	-0.154	-0.122
Hispanic	-0.100	0.018	-0.184	-0.017	-0.034	-0.001	0.977	-0.085	0.082	-0.007	-0.062	0.346	-0.192	0.067	-0.026
Non-Hispanic Other	-0.218	0.001	-0.344	-0.093	-0.067	-0.023	0.760	-0.172	0.125	-0.001	-0.229	0.038	-0.446	-0.012	-0.088
Single Parent	-0.080	0.053	-0.161	0.001	-0.024	-0.061	0.183	-0.150	0.029	-0.023	0.004	0.956	-0.127	0.134	0.002
Other	-0.139	0.002	-0.229	-0.050	-0.046	-0.184	0.001	-0.290	-0.079	-0.071	-0.128	0.087	-0.274	0.019	-0.051
English	-0.173	0.003	-0.287	-0.059	-0.042	-0.247	0.001	-0.397	-0.097	-0.089	-0.180	0.042	-0.353	-0.007	-0.068
Public Insurance	0.136	0.001	0.056	0.217	0.038	-0.034	0.423	-0.116	0.049	-0.016	-0.190	0.003	-0.316	-0.065	-0.077
Uninsured	-0.140	0.036	-0.270	-0.009	-0.083	-0.190	0.008	-0.330	-0.050	-0.094	-0.281	0.025	-0.527	-0.035	-0.123
< 100% FPL	-0.099	0.110	-0.220	0.022	-0.039	-0.083	0.161	-0.200	0.033	-0.040	-0.091	0.331	-0.274	0.093	-0.047
100-199% FPL	-0.142	0.006	-0.242	-0.041	-0.054	-0.047	0.346	-0.145	0.051	-0.032	-0.209	0.015	-0.378	-0.041	-0.091
200-399% FPL	-0.016	0.703	-0.097	0.066	-0.013	0.000	0.996	-0.080	0.080	-0.001	-0.110	0.094	-0.238	0.019	-0.046
< High School	-0.014	0.792	-0.117	0.089	-0.016	-0.058	0.325	-0.173	0.057	-0.035	-0.057	0.463	-0.208	0.095	-0.026
High School Grad	-0.019	0.608	-0.094	0.055	-0.013	-0.060	0.107	-0.133	0.013	-0.030	-0.084	0.105	-0.186	0.018	-0.035
Midwest	-0.168	0.002	-0.271	-0.064	-0.064	-0.103	0.047	-0.205	-0.001	-0.046	0.034	0.677	-0.126	0.193	0.010
South	0.095	0.057	-0.003	0.193	0.000	0.044	0.383	-0.056	0.145	-0.004	0.000	0.996	-0.152	0.153	-0.010
West	-0.200	0.000	-0.308	-0.092	-0.087	-0.075	0.154	-0.179	0.028	-0.036	0.044	0.617	-0.127	0.214	0.009
MSA	-0.075	0.068	-0.155	0.006	-0.026	0.030	0.489	-0.055	0.115	0.000	-0.154	0.008	-0.267	-0.040	-0.061
Good health	0.103	0.003	0.034	0.171	0.038	0.118	0.001	0.047	0.189	0.043	0.106	0.050	0.000	0.211	0.041
Fair or poor	0.052	0.498	-0.099	0.203	0.016	0.188	0.004	0.062	0.315	0.071	0.075	0.403	-0.100	0.249	0.028
Disability	-0.007	0.961	-0.274	0.260	-0.009	0.292	0.106	-0.062	0.647	0.114	-0.039	0.826	-0.385	0.308	-0.017
Chronic condition	0.048	0.186	-0.023	0.119	0.033	0.050	0.177	-0.022	0.122	0.032	0.002	0.964	-0.107	0.112	0.009

Table E.2: ER/Hospital Utilization, by Condition Type

	Acute Conditions					ACS Conditions					Chronic Conditions				
	Coef	P	95% CI		dx/dy	Coef	P	95% CI		dx/dy	Coef	P	95% CI		dx/dy
Usual Source of Care	-0.332	0.519	-1.344	0.679	-0.011	-0.741	0.048	-1.474	-0.008	-0.102	0.928	0.109	-0.207	2.063	0.021
Male	0.063	0.295	-0.055	0.182	0.002	0.016	0.695	-0.066	0.099	0.001	0.009	0.909	-0.148	0.166	-0.001
6-12 years old	-0.239	0.000	-0.366	-0.111	-0.005	-0.314	0.000	-0.411	-0.218	-0.023	-0.200	0.282	-0.564	0.165	-0.010
13-17 years old	-0.268	0.007	-0.461	-0.074	-0.009	-0.391	0.000	-0.513	-0.268	-0.046	-0.203	0.292	-0.581	0.175	-0.015
Non-Hispanic Black	0.205	0.019	0.034	0.377	0.006	0.267	0.000	0.120	0.415	0.030	0.312	0.012	0.068	0.556	0.018
Hispanic	0.103	0.275	-0.082	0.288	0.003	0.060	0.368	-0.071	0.191	0.006	0.003	0.982	-0.214	0.219	-0.001
Non-Hispanic Other	0.069	0.644	-0.224	0.362	0.002	0.207	0.069	-0.016	0.430	0.023	0.167	0.379	-0.206	0.541	0.009
Single Parent	0.054	0.481	-0.096	0.203	0.001	0.148	0.015	0.029	0.267	0.015	0.055	0.611	-0.156	0.265	0.003
Other	0.208	0.016	0.039	0.377	0.006	0.183	0.005	0.056	0.310	0.018	0.127	0.309	-0.118	0.371	0.005
English	0.305	0.020	0.047	0.563	0.006	-0.068	0.472	-0.255	0.118	-0.007	-0.114	0.473	-0.428	0.199	-0.004
Public Insurance	0.139	0.086	-0.019	0.297	0.004	0.097	0.137	-0.031	0.224	0.009	0.057	0.623	-0.171	0.285	0.000
Uninsured	0.096	0.465	-0.162	0.355	0.002	-0.099	0.315	-0.293	0.095	-0.010	0.181	0.384	-0.227	0.590	-0.001
< 100% FPL	0.203	0.102	-0.041	0.446	0.006	0.196	0.023	0.027	0.365	0.020	0.362	0.021	0.055	0.670	0.012
100-199% FPL	0.245	0.029	0.025	0.464	0.007	0.149	0.060	-0.006	0.305	0.015	0.190	0.207	-0.105	0.484	0.002
200-399% FPL	0.132	0.207	-0.073	0.338	0.003	0.152	0.019	0.025	0.279	0.015	0.118	0.309	-0.110	0.346	0.003
< High School	0.242	0.028	0.026	0.458	0.007	0.086	0.283	-0.071	0.244	0.008	0.074	0.587	-0.193	0.340	0.001
High School Grad	0.181	0.017	0.032	0.330	0.005	0.119	0.020	0.018	0.219	0.011	0.141	0.123	-0.038	0.321	0.005
Midwest	0.247	0.015	0.048	0.446	0.007	0.054	0.435	-0.082	0.191	0.005	0.029	0.818	-0.218	0.276	0.000
South	0.242	0.015	0.047	0.436	0.007	0.151	0.018	0.026	0.277	0.014	0.116	0.396	-0.153	0.386	0.000
West	0.141	0.172	-0.061	0.343	0.003	-0.072	0.322	-0.215	0.071	-0.007	0.147	0.329	-0.148	0.442	0.003
MSA	-0.150	0.043	-0.295	-0.005	-0.004	-0.053	0.333	-0.160	0.054	-0.005	0.114	0.253	-0.082	0.310	0.004
Good health	-0.010	0.888	-0.146	0.127	0.000	0.059	0.234	-0.038	0.156	0.006	0.239	0.019	0.039	0.439	0.011
Fair or poor	0.064	0.591	-0.170	0.298	0.002	0.310	0.000	0.145	0.475	0.036	0.379	0.001	0.150	0.608	0.020
Disability	0.313	0.059	-0.011	0.638	0.011	0.102	0.546	-0.229	0.433	0.010	0.153	0.561	-0.364	0.670	0.007
Chronic condition	0.134	0.039	0.007	0.262	0.003	0.132	0.008	0.034	0.229	0.013	-0.142	0.241	-0.379	0.096	-0.001

Table E.3: ER/Hospital Utilization Among Children Using Ambulatory Care, by Condition Type

	Acute Conditions					ACS Conditions					Chronic Conditions				
	Coef	P	95% CI		dx/dy	Coef	P	95% CI		dx/dy	Coef	P	95% CI		dx/dy
Usual Source of Care	-0.253	0.776	-1.996	1.491	-0.006	-0.254	0.663	-1.398	0.889	-0.020	1.278	0.000	0.659	1.898	1.278
Male	-0.053	0.595	-0.248	0.143	-0.001	-0.010	0.879	-0.142	0.122	-0.001	0.017	0.869	-0.186	0.220	0.017
6-12 years old	-0.202	0.109	-0.449	0.045	-0.003	-0.217	0.011	-0.384	-0.050	-0.013	-0.132	0.504	-0.519	0.255	-0.132
13-17 years old	-0.121	0.419	-0.414	0.172	-0.002	-0.243	0.017	-0.442	-0.044	-0.020	-0.109	0.597	-0.513	0.295	-0.109
Non-Hispanic Black	0.135	0.366	-0.158	0.428	0.003	0.145	0.219	-0.086	0.376	0.011	-0.178	0.314	-0.525	0.169	-0.178
Hispanic	-0.248	0.098	-0.542	0.046	-0.004	0.019	0.863	-0.198	0.236	0.001	-0.117	0.486	-0.448	0.213	-0.117
Non-Hispanic Other	-0.097	0.708	-0.606	0.412	-0.002	0.085	0.629	-0.261	0.432	0.007	-0.082	0.703	-0.506	0.341	-0.082
Single Parent	-0.065	0.545	-0.277	0.146	-0.001	0.105	0.320	-0.102	0.311	0.008	-0.040	0.800	-0.351	0.271	-0.040
Other	0.032	0.839	-0.281	0.346	0.001	0.166	0.151	-0.060	0.392	0.012	0.266	0.141	-0.089	0.621	0.266
English	0.357	0.099	-0.068	0.781	0.004	0.089	0.481	-0.159	0.337	0.005	-0.010	0.966	-0.478	0.458	-0.010
Public Insurance	0.297	0.060	-0.013	0.607	0.007	0.044	0.670	-0.159	0.246	0.002	0.035	0.824	-0.276	0.347	0.035
Uninsured	0.332	0.132	-0.100	0.763	0.008	-0.113	0.436	-0.399	0.172	-0.009	0.128	0.591	-0.339	0.595	0.128
< 100% FPL	0.396	0.051	-0.002	0.794	0.011	0.143	0.278	-0.115	0.401	0.011	0.567	0.005	0.171	0.963	0.567
100-199% FPL	0.220	0.265	-0.167	0.607	0.005	0.150	0.211	-0.085	0.385	0.010	0.385	0.036	0.025	0.744	0.385
200-399% FPL	0.253	0.111	-0.059	0.565	0.006	0.117	0.202	-0.063	0.297	0.009	0.081	0.613	-0.235	0.398	0.081
< High School	0.257	0.176	-0.115	0.629	0.006	0.115	0.376	-0.139	0.369	0.007	0.273	0.090	-0.043	0.590	0.273
High School Grad	0.111	0.312	-0.105	0.328	0.002	0.133	0.111	-0.031	0.296	0.009	0.348	0.005	0.108	0.588	0.348
Midwest	0.301	0.076	-0.032	0.634	0.007	0.135	0.223	-0.082	0.352	0.009	0.132	0.462	-0.220	0.484	0.132
South	0.191	0.243	-0.130	0.512	0.004	0.256	0.014	0.053	0.460	0.019	0.195	0.254	-0.141	0.530	0.195
West	-0.027	0.880	-0.382	0.328	-0.001	0.100	0.447	-0.158	0.359	0.007	0.184	0.375	-0.223	0.592	0.184
MSA	-0.045	0.733	-0.304	0.214	-0.001	0.030	0.726	-0.137	0.196	0.002	0.336	0.018	0.057	0.616	0.336
Good health	0.175	0.138	-0.056	0.406	0.004	0.136	0.083	-0.018	0.290	0.010	0.307	0.030	0.030	0.584	0.307
Fair or poor	0.244	0.217	-0.144	0.632	0.006	0.592	0.000	0.368	0.816	0.064	0.484	0.009	0.124	0.844	0.484
Disability	0.180	0.529	-0.380	0.740	0.004	-0.097	0.671	-0.544	0.351	-0.006	0.477	0.193	-0.242	1.195	0.477
Chronic condition	0.119	0.269	-0.092	0.331	0.002	0.089	0.267	-0.069	0.247	0.007	-0.181	0.133	-0.417	0.055	-0.181

Appendix F: Full Models Accounting for Clustering Effects

Table F.1: Ambulatory Care Utilization, by Condition Type

	Acute Conditions					ACS Conditions					Chronic Conditions				
	Coef	P	95% CI		dx/dy	Coef	P	95% CI		dx/dy	Coef	P	95% CI		dx/dy
Usual Source of Care	0.874	0.000	-1.014	-0.629	0.247	0.424	0.062	-0.021	0.869	0.154	-0.058	0.891	-0.888	0.772	-0.022
Male	-0.014	0.152	-0.137	0.021	-0.009	-0.070	0.003	-0.115	-0.024	-0.030	-0.049	0.194	-0.124	0.025	-0.024
6-12 years old	-0.240	0.000	-0.412	-0.218	-0.107	-0.315	0.000	-0.368	-0.261	-0.135	-0.125	0.011	-0.222	-0.028	-0.071
13-17 years old	-0.451	0.000	-0.634	-0.423	-0.185	-0.511	0.000	-0.587	-0.436	-0.214	-0.262	0.000	-0.378	-0.146	-0.130
Non-Hispanic Black	-0.244	0.799	-0.146	0.112	-0.083	-0.177	0.000	-0.257	-0.097	-0.066	-0.332	0.000	-0.450	-0.213	-0.124
Hispanic	-0.027	0.070	-0.227	0.009	-0.018	0.047	0.191	-0.023	0.117	0.013	-0.145	0.012	-0.257	-0.032	-0.057
Non-Hispanic Other	-0.173	0.178	-0.275	0.051	-0.066	-0.082	0.176	-0.201	0.037	-0.026	-0.243	0.016	-0.441	-0.046	-0.093
Single Parent	-0.089	0.219	-0.169	0.039	-0.036	-0.071	0.031	-0.135	-0.007	-0.028	-0.077	0.138	-0.178	0.025	-0.026
Other	-0.150	0.170	-0.187	0.033	-0.057	-0.160	0.000	-0.235	-0.085	-0.073	-0.141	0.028	-0.268	-0.015	-0.053
English	-0.147	0.001	0.098	0.365	-0.032	-0.238	0.000	-0.327	-0.150	-0.083	-0.246	0.001	-0.395	-0.097	-0.094
Public Insurance	0.126	0.460	-0.156	0.070	0.041	-0.046	0.170	-0.112	0.020	-0.023	-0.083	0.130	-0.190	0.024	-0.037
Uninsured	-0.172	0.000	-0.772	-0.545	-0.116	-0.194	0.000	-0.298	-0.090	-0.119	-0.200	0.031	-0.382	-0.018	-0.110
< 100% FPL	-0.123	0.039	-0.333	-0.009	-0.055	-0.073	0.122	-0.166	0.020	-0.044	-0.082	0.285	-0.232	0.068	-0.053
100-199% FPL	-0.160	0.010	-0.337	-0.046	-0.069	-0.067	0.099	-0.147	0.013	-0.050	-0.143	0.036	-0.278	-0.009	-0.076
200-399% FPL	-0.036	0.006	-0.312	-0.053	-0.027	-0.031	0.355	-0.096	0.034	-0.017	-0.065	0.224	-0.169	0.040	-0.037
< High School	-0.036	0.000	-0.379	-0.119	-0.033	-0.018	0.669	-0.100	0.064	-0.027	-0.048	0.480	-0.181	0.085	-0.034
High School Grad	-0.013	0.014	-0.231	-0.026	-0.014	-0.059	0.038	-0.115	-0.003	-0.029	-0.053	0.245	-0.143	0.036	-0.025
Midwest	-0.131	0.021	-0.322	-0.026	-0.058	-0.068	0.087	-0.146	0.010	-0.036	0.044	0.500	-0.084	0.172	0.016
South	0.137	0.000	-0.601	-0.331	0.008	0.074	0.049	0.000	0.147	0.005	0.039	0.529	-0.082	0.160	-0.003
West	-0.138	0.000	-0.511	-0.236	-0.077	-0.033	0.406	-0.110	0.044	-0.023	0.071	0.291	-0.061	0.204	0.017
MSA	-0.081	0.148	-0.183	0.028	-0.034	-0.026	0.380	-0.084	0.032	-0.024	-0.143	0.003	-0.237	-0.049	-0.061
Good health	0.106	0.544	-0.059	0.112	0.040	0.121	0.000	0.067	0.174	0.046	0.097	0.025	0.012	0.181	0.037
Fair or poor	0.072	0.428	-0.269	0.114	0.019	0.148	0.003	0.051	0.244	0.054	0.028	0.693	-0.111	0.167	0.000
Disability	0.073	0.629	-0.541	0.327	0.017	0.018	0.871	-0.199	0.235	0.008	-0.129	0.377	-0.416	0.158	-0.050
Chronic condition	0.055	0.000	0.283	0.509	0.046	0.057	0.051	0.000	0.115	0.043	0.003	0.944	-0.086	0.092	0.021

Table F.2: ER/Hospital Utilization, by Condition Type

	Acute Conditions					ACS Conditions					Chronic Conditions				
	Coef	P	95% CI		dx/dy	Coef	P	95% CI		dx/dy	Coef	P	95% CI		dx/dy
Usual Source of Care	-0.290	0.463	-1.064	0.485	-0.015	-0.551	0.032	-1.055	-0.047	-0.099	0.447	0.404	-0.603	1.497	0.024
Male	0.065	0.184	-0.031	0.161	0.002	0.003	0.944	-0.068	0.073	0.000	-0.042	0.536	-0.176	0.092	-0.005
6-12 years old	-0.250	0.000	-0.360	-0.140	-0.010	-0.302	0.000	-0.384	-0.220	-0.038	-0.279	0.006	-0.477	-0.080	-0.025
13-17 years old	-0.284	0.000	-0.432	-0.136	-0.010	-0.365	0.000	-0.474	-0.256	-0.041	-0.292	0.019	-0.537	-0.047	-0.025
Non-Hispanic Black	0.076	0.289	-0.065	0.218	0.003	0.249	0.000	0.138	0.359	0.037	0.306	0.001	0.121	0.491	0.028
Hispanic	0.032	0.655	-0.107	0.170	0.001	0.067	0.218	-0.039	0.173	0.009	0.063	0.530	-0.134	0.261	0.004
Non-Hispanic Other	0.042	0.722	-0.189	0.272	0.002	0.157	0.089	-0.024	0.337	0.023	0.232	0.133	-0.071	0.534	0.020
Single Parent	0.072	0.257	-0.052	0.195	0.003	0.091	0.067	-0.006	0.188	0.012	0.041	0.645	-0.134	0.216	0.004
Other	0.184	0.006	0.053	0.315	0.008	0.137	0.010	0.032	0.241	0.018	0.128	0.211	-0.073	0.328	0.011
English	0.395	0.000	0.213	0.576	0.012	0.022	0.746	-0.111	0.154	0.003	0.070	0.621	-0.206	0.346	0.005
Public Insurance	0.160	0.016	0.029	0.291	0.007	0.103	0.043	0.003	0.202	0.013	0.008	0.937	-0.179	0.195	-0.001
Uninsured	0.073	0.500	-0.139	0.284	0.001	-0.006	0.934	-0.149	0.137	-0.004	0.225	0.150	-0.081	0.531	0.009
< 100% FPL	0.169	0.099	-0.032	0.369	0.007	0.194	0.010	0.046	0.342	0.026	0.342	0.014	0.070	0.613	0.024
100-199% FPL	0.244	0.008	0.063	0.425	0.011	0.150	0.029	0.015	0.285	0.019	0.165	0.201	-0.088	0.417	0.007
200-399% FPL	0.094	0.289	-0.080	0.269	0.004	0.176	0.002	0.062	0.290	0.024	0.213	0.045	0.005	0.422	0.014
< High School	0.257	0.001	0.100	0.414	0.012	0.082	0.183	-0.039	0.203	0.010	0.073	0.549	-0.165	0.311	0.002
High School Grad	0.202	0.001	0.087	0.318	0.009	0.116	0.009	0.028	0.204	0.015	0.131	0.098	-0.024	0.285	0.009
Midwest	0.207	0.015	0.040	0.373	0.009	-0.034	0.580	-0.156	0.087	-0.005	0.006	0.962	-0.226	0.237	0.000
South	0.174	0.037	0.010	0.337	0.006	0.047	0.422	-0.067	0.160	0.005	0.021	0.858	-0.207	0.249	-0.002
West	0.058	0.523	-0.121	0.238	0.002	-0.118	0.072	-0.246	0.011	-0.015	0.065	0.593	-0.174	0.304	0.003
MSA	-0.082	0.151	-0.193	0.030	-0.004	-0.053	0.245	-0.142	0.036	-0.008	0.091	0.289	-0.077	0.259	0.005
Good health	0.036	0.521	-0.073	0.144	0.001	0.096	0.022	0.014	0.177	0.013	0.104	0.174	-0.046	0.255	0.008
Fair or poor	0.016	0.878	-0.188	0.220	0.000	0.388	0.000	0.257	0.519	0.064	0.441	0.000	0.244	0.638	0.042
Disability	0.320	0.035	0.022	0.617	0.017	0.027	0.831	-0.219	0.273	0.004	0.161	0.497	-0.303	0.625	0.014
Chronic condition	0.131	0.028	0.014	0.247	0.006	0.123	0.004	0.040	0.205	0.018	-0.053	0.557	-0.231	0.124	0.001

Table F3: ER/Hospital Utilization Among Children Using Ambulatory Care, by Condition Type

	Acute Conditions					ACS Conditions					Chronic Conditions				
	Coef	P	95% CI		dx/dy	Coef	P	95% CI		dx/dy	Coef	P	95% CI		dx/dy
Usual Source of Care	-0.762	0.428	-2.646	1.121	-0.048	-0.671	0.154	-1.593	0.251	-0.114	0.556	0.404	-0.751	1.863	0.023
Male	-0.116	0.184	-0.287	0.055	-0.003	-0.037	0.514	-0.147	0.074	-0.004	-0.018	0.853	-0.211	0.175	-0.002
6-12 years old	-0.361	0.000	-0.560	-0.163	-0.010	-0.284	0.000	-0.415	-0.153	-0.029	-0.249	0.087	-0.534	0.036	-0.021
13-17 years old	-0.119	0.332	-0.358	0.121	-0.003	-0.249	0.006	-0.426	-0.073	-0.024	-0.313	0.084	-0.668	0.042	-0.022
Non-Hispanic Black	-0.026	0.839	-0.273	0.222	-0.001	0.181	0.069	-0.014	0.376	0.023	0.150	0.366	-0.175	0.474	0.014
Hispanic	-0.215	0.109	-0.477	0.048	-0.006	0.067	0.440	-0.103	0.236	0.007	0.071	0.637	-0.225	0.368	0.004
Non-Hispanic Other	-0.127	0.601	-0.604	0.350	-0.003	-0.011	0.941	-0.300	0.278	-0.001	0.194	0.422	-0.279	0.666	0.012
Single Parent	0.038	0.717	-0.166	0.241	0.001	0.060	0.465	-0.102	0.222	0.007	-0.081	0.544	-0.341	0.180	-0.005
Other	0.029	0.814	-0.216	0.275	0.001	0.061	0.490	-0.113	0.235	0.007	0.144	0.378	-0.176	0.463	0.010
English	0.417	0.017	0.073	0.762	0.009	0.083	0.424	-0.120	0.285	0.009	0.223	0.271	-0.174	0.619	0.011
Public Insurance	0.306	0.014	0.062	0.550	0.010	-0.035	0.665	-0.194	0.124	-0.004	-0.049	0.727	-0.323	0.226	-0.004
Uninsured	0.332	0.072	-0.030	0.695	0.013	-0.173	0.163	-0.415	0.070	-0.018	0.076	0.762	-0.413	0.564	-0.002
< 100% FPL	0.189	0.284	-0.157	0.534	0.006	0.240	0.042	0.008	0.472	0.029	0.530	0.006	0.150	0.910	0.037
100-199% FPL	0.112	0.500	-0.213	0.436	0.003	0.183	0.081	-0.022	0.388	0.021	0.266	0.14	-0.087	0.618	0.014
200-399% FPL	0.124	0.403	-0.167	0.414	0.004	0.155	0.069	-0.012	0.322	0.018	0.184	0.235	-0.120	0.488	0.011
< High School	0.187	0.194	-0.095	0.470	0.006	0.001	0.991	-0.195	0.197	0.000	0.175	0.325	-0.173	0.522	0.008
High School Grad	0.196	0.052	-0.002	0.393	0.006	0.082	0.256	-0.060	0.224	0.009	0.238	0.043	0.007	0.468	0.014
Midwest	0.116	0.418	-0.165	0.398	0.004	0.028	0.778	-0.167	0.223	0.003	0.094	0.572	-0.233	0.422	0.006
South	0.080	0.551	-0.184	0.344	0.002	0.079	0.395	-0.103	0.261	0.008	0.008	0.96	-0.319	0.336	-0.003
West	-0.124	0.434	-0.433	0.186	-0.003	-0.015	0.891	-0.224	0.195	-0.002	-0.078	0.691	-0.462	0.306	-0.008
MSA	-0.047	0.632	-0.240	0.146	-0.001	-0.037	0.611	-0.178	0.104	-0.004	0.279	0.032	0.024	0.535	0.014
Good health	0.184	0.059	-0.007	0.375	0.006	0.144	0.027	0.016	0.272	0.017	0.228	0.045	0.005	0.451	0.016
Fair or poor	0.042	0.817	-0.313	0.396	0.001	0.602	0.000	0.416	0.788	0.096	0.565	0.000	0.278	0.851	0.057
Disability	0.276	0.248	-0.193	0.746	0.011	0.025	0.898	-0.355	0.405	0.003	0.552	0.107	-0.118	1.222	0.053
Chronic condition	0.211	0.025	0.026	0.396	0.007	0.113	0.083	-0.015	0.241	0.013	-0.015	0.905	-0.262	0.232	0.002

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