Measuring the Impact of Hurricane Katrina on Access to a Personal Healthcare Provider: The Use of the National Survey of Children's Health for an External Comparison Group

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Abstract This paper examined the effect of Hurricane Katrina on children's access to personal healthcare providers and evaluated the use of propensity score methods to compare a nationally representative sample of children, as a proxy for an unexposed group, with a smaller exposed sample. 2007 data from the Gulf Coast Child and Family Health (G-CAFH) Study, a longitudinal cohort of households displaced or greatly impacted by Hurricane Katrina, were matched with 2007 National Survey of Children's Health (NSCH) data using propensity score techniques. Propensity scores were created using poverty level, household educational attainment, and race/ethnicity, with and without the addition of child age and gender. The outcome was defined as having a personal healthcare provider. Additional confounders (household structure, neighborhood safety, health and insurance status) were also examined. All covariates except gender differed significantly between the exposed (G-CAFH) and unexposed (NSCH) samples. Fewer G-CAFH children had a personal healthcare provider (65 %) compared to those from NSCH (90 %). Adjusting for all covariates, the propensity score analysis showed exposed children were 20 % less likely to have a personal healthcare provider compared to unexposed children in the US (OR = 0.80, 95 % CI 0.76, 0.84),

whereas the logistic regression analysis estimated a stronger effect (OR = 0.28, 95 % CI 0.21, 0.39). Two years after Hurricane Katrina, children exposed to the storm had significantly lower odds of having a personal health care provider compared to unexposed children. Propensity score matching techniques may be useful for combining separate data samples when no clear unexposed group exists.

Keywords Hurricane Katrina · National Survey of Children's Health · Personal healthcare provider · Propensity score

Introduction

Medical homes provide high-quality medical care that is accessible, continuous, comprehensive, coordinated, family-centered, compassionate and culturally effective [1–4] and are endorsed by major primary care organizations [5–7]. The benefits of the medical home concept have been well-documented [5–18] and are supported even when only some of the key components are present. Identification with a specific primary care practitioner, for example, has been associated with better preventive care, lower healthcare costs, fewer hospitalizations and fewer emergency department visits [8–11].

Not all children have equal access to such health services. Children living in poverty, unsafe neighborhoods, or in households with limited education or a single-parent are significantly less likely to have a regular source of medical care or medical home [12–21]. Other factors negatively associated with having a usual source of care include race/ethnicity, poor health and being uninsured [13–16, 18].

Children greatly impacted by the 2005 Hurricane Katrina shared many of these characteristics. Louisiana evacuees

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were predominantly African-American, poor, and with limited education [22–24]. In Mississippi, the most seriously damaged areas had significantly more households in poverty and with limited education (unpublished analysis, [25, 26]). In addition to these factors, the overall disruption experienced by households and healthcare systems was likely to upset pre-existing family-provider relationships [27–29].

One would expect the children exposed to the consequences of Katrina would be less likely to have a personal healthcare provider. However, responses to the hurricane by numerous organizations may have mitigated some of the effect. Programs such as Disaster Relief Medicaid and longer-term assistance [30] as well as efforts by local and non-profit organizations to provide health services [29] may have increased access to personal healthcare providers. This article tested whether, 2 years after Hurricane Katrina, exposed children were less likely to have a personal healthcare provider than similar unexposed children.

Using Multiple Datasets

Epidemiologic research seeks to compare equivalent groups of people who vary only on exposure status; differences in outcomes are then presumed to be due to exposure. Valid comparison groups, however, are not always available. Six months after Hurricane Katrina, residents from southern Louisiana and Mississippi were recruited into the Gulf Coast Child and Family Health (G-CAFH) Study in order to assess long-term health, mental health and service needs [31]. But because the hurricane affected such a large geographic area [23, 31–33], finding an unaffected comparison group from the same communities and with similar characteristics would have been extremely challenging.

This paper explored the utility of a nationally representative sample, the National Survey of Children's Health (NSCH), as a proxy for such a comparison group in investigating the impact of Hurricane Katrina on having a personal healthcare provider. Furthermore, it examined the application of the propensity score matching method. This approach matches respondents on their probability of exposure so that, within matched groups, the likelihood of being exposed is essentially random [34–41]. Matched groups are then used to estimate the effect of exposure while controlling for confounding. The advantage of the propensity score approach over traditional methods of comparison lies in its assessment of the suitability of the comparison groups [37, 38, 40], reducing the chance of biased estimates and incorrect inferences regarding the effect of exposure. This project evaluated results obtained from both propensity score methods and traditional approaches and explored the use of secondary data when no clear control group existed [35, 42, 43].

Methods

Gulf Coast Child and Family Health Study

The exposed group consisted of G-CAFH children greatly impacted by Hurricane Katrina. Details of the data collection have been published elsewhere. Briefly, within 12 months of the hurricane, participants were recruited from randomly-selected FEMA-subsidized housing sites in Louisiana and Mississippi; additional respondents were randomly-selected from moderately- to extensively-damaged census blocks in Mississippi. Respondents from 1,079 households (response rate 32.6 %, cooperation rate 67.9 %) agreed to follow-up and have been reinterviewed annually [44–46].

This analysis focused on 2007 data; 803 households, 320 of which had at least one child under the age of 18 years, completed telephone surveys (75.2 % follow-up participation rate). One child from each household was randomly-selected using a Kish sampling strategy [47]. Data on selected children were collected from adult respondents, usually their parents.

National Survey of Children's Health

The unexposed group was composed of children from the 2007 NSCH sample. US households with children were selected using random-digit-dial techniques and interviews were conducted with 91,642 respondents [48]. Additional details are described in this issue. This analysis used publicly-available NSCH data [49].

Given the scale of Hurricane Katrina, some NSCH children, especially in Louisiana and Mississippi, may have had some exposure; however, no exposure data were collected. Complicating matters, Louisiana and Mississippi differ from other states on important factors, such as policies supporting the economic security of families [50–52], suggesting state-level characteristics may introduce unmeasured confounding. Consequently, three comparison groups of NSCH children were utilized to address these issues: (1) a national reference group, excluding Louisiana and Mississippi, with the least exposure to Hurricane Katrina; (2) a group from Texas and Alabama, states characteristically similar to Louisiana and Mississippi [50], but not as affected by the hurricane; and (3) a group from Louisiana and Mississippi who may have had some exposure to Katrina, but were not expected to be affected to the same extent as G-CAFH children.

Personal Healthcare Provider

The outcome was an established relationship with a personal doctor or nurse. Both samples were presented the following definition and question: "A personal doctor or

nurse is a health professional who knows your child well and is familiar with your child's health history. This can be a general doctor, a pediatrician, a specialist doctor, a nurse practitioner, or a physician's assistant. [Right now,] do you have one or more persons you think of as [the child's] personal doctor or nurse?" "Right now" was used in the G-CAFH survey to focus respondents on post-Katrina relationships with providers. Positive responses were categorized as having access to a personal provider.

Covariates

Covariates were selected based on previous research and availability in the NSCH and G-CAFH datasets. Poverty was defined as living below the 2007 Federal Poverty Level (FPL) based on household income and size. Pre-Katrina income was used for G-CAFH households because 2007 income was potentially affected by exposure. A single imputation of NSCH poverty data, provided by the National Center for Health Statistics, was included to account for non-random missing data [49]. Household educational attainment in both samples was defined as the highest achievement among all adults in the household and grouped into less than high school, high school graduate or GED, and more than high school. Educational attainment of G-CAFH adults was measured in 2008; 59 households did not participate in the 2008 interview and were excluded from the adjusted and propensity score analyses. Household structure was categorized into two-parent households (biological, adoptive or step) and other. In both surveys, safe neighborhoods were those in which respondents reported feeling their children were "usually" or "always" safe. Child health was categorized into "fair" or "poor" versus "excellent," "very good," or "good." These variables were dichotomized in order to ensure adequate power to detect meaningful differences in the traditional logistic regression analysis [53].

Few G-CAFH children were Hispanic (3.2 %) or of other races (2.2 %), so the race/ethnicity variable was dichotomized into Black, non-Hispanic versus all others. Finally, child gender and age (0–5, 6–11, and 12–17 years) were included in the analyses.

Traditional Analysis

Two types of analyses were conducted using a single dataset of appended G-CAFH and NSCH data: a traditional approach and a propensity score matching method. The traditional approach assessed covariate frequencies using Pearson's Chi-squared tests. Unadjusted and adjusted estimates of effect were calculated using logistic regression; adjusted estimates controlled for the covariates listed above. Separate models were run for each comparison group. NSCH survey weights were used to estimate effect sizes.

Propensity Score Analysis

This analysis was conducted in several steps: (1) propensity score development, (2) respondent matching, and (3) effect estimation [35]. Propensity scores are typically calculated with predictors of exposure. In this analysis, exposure included living in damaged areas and displacement in FEMA-subsidized housing for at least 6 months. A priori, poverty level, household educational attainment, and race/ethnicity were hypothesized to be associated with exposure. Because household structure, neighborhood safety, child health and insurance may have been consequences of exposure to Katrina [54–56], they were excluded from the propensity scores estimation. Anecdotal evidence, for example, suggested that some displaced families were sent to trailer parks in which they did not feel safe; in other families, post-Katrina stressors led to divorce or separation. Because these variables were important to control when estimating Katrina's effect on healthcare access, yet inappropriate to include in the propensity score calculation, we first generated the propensity scores and then assessed the effect estimates while controlling for the other variables. This approach was a mix of propensity score matching methods and weighted regression, but, for simplicity, it is referred to as the propensity score approach.

Age and gender were neither potential predictors nor outcomes of exposure, so two propensity scores were calculated: one without age and gender and one with, referred to as the 3- and 5-variable analyses, respectively. Proximity to the coast could not be included due to limitations of the NSCH public dataset.

The propensity score analysis was conducted with the *pscore* and *attnd* algorithms in Stata [57]. A logistic regression model calculated the propensity scores using the specified covariates, then respondents were matched using nearest neighbor techniques with replacement and without calipers. The nearest neighbor approach finds the closest propensity score to match, while "with replacement" allows observations to be matched multiple times. If one-to-one matching had been used, thousands of NSCH observations would have been discarded; instead, respondents were returned to the pool of observations available for re-matching. Calipers set the acceptable range of propensity scores for matching; smaller values limit the number of available matches and, theoretically, increase the exchangeability of those matched. In lieu of setting calipers, the *pscore* procedure uses t-tests to assemble blocks of observations in which the mean propensity scores of the exposed and unexposed are not significantly different, and then tests for covariate balance [57]. The matching is successful if the covariates are balanced within blocks. Analyses were restricted to overlapping (matched) observations.

The effect of Hurricane Katrina was estimated using the average effect of the treatment on the treated (ATT). Assuming exchangeability across all possible covariates, the ATT theoretically compares the proportion of exposed children (the “treated”) with a personal healthcare provider (the “effect”) with the proportion that would have had a provider if they had not been exposed (“untreated”). In this analysis, the *attnd* procedure derived the ATTs using both the estimated propensity scores and weighted regression to adjust for the additional covariates. The ATTs were converted to odds ratios for comparison with the traditional results.

The 3-variable propensity score procedure successfully matched 255 G-CAFH children with children from the US (87,608), Alabama/Texas (3,552), and Louisiana/Mississippi (3,772) samples, respectively. All blocks of observations were balanced on poverty level, household educational attainment, and race/ethnicity. The 5-variable procedure was less successful in matching 253 G-CAFH children; several covariates remained unbalanced. In the national comparison, three of nine blocks were not balanced on education only, education and age, or gender. Two of the six Alabama/Texas blocks were not balanced on either age or education. Three of the four Louisiana/Mississippi groups were not balanced on race/ethnicity.

Sensitivity Analysis

To test the effect of different specifications on the ATT estimates, the *psmatch2* algorithm was utilized [57]. The procedure allows for specification of calipers and replacement, but does not accommodate the separate control for

additional variables. Since the purpose was to test the sensitivity of the results, rather than to estimate Katrina’s effects, the inclusion of potential outcomes of exposure in the propensity score calculation was considered acceptable. Analyses were run without replacement (one-to-one matching), and with caliper widths of 0.05, 0.01 and 0.001.

All analyses were conducted in Stata 10 [58]. Observations with missing values were excluded from each analysis. For example, all available observations were included in the propensity score matching, but the final adjusted results were limited to 243 G-CAFH and 89,799 NSCH observations with complete data.

Results

Traditional Analysis

As discussed above, the G-CAFH sample was compared with the national NSCH sample, excluding Louisiana and Mississippi (“US excl. LA/MS” in the tables), Alabama and Texas (“AL/TX”), and Louisiana and Mississippi (“LA/MS”). Frequency comparisons (Table 1) showed significant differences in the proportion with personal healthcare providers between the NSCH (about 90 %) and G-CAFH groups (65 %). G-CAFH children were significantly more likely to be Black, live in poverty, and have fair/poor physical health, and less likely to live with two parents or in safe neighborhoods. Adults living in NSCH households were more highly educated than those in the G-CAFH households. Insurance status was similar between

Table 1 Frequencies of select characteristics among the G-CAFH and NSCH samples

	G-CAFH	NSCH		
		US excl LA/MS	AL/TX	LA/MS
Overall sample size (n)	320	87,856	3,566	3,786
Personal healthcare provider (%)	64.67	92.25***	89.56***	90.06***
Living below 2007 FPL (%)	68.13	18.28***	24.27***	28.06***
<i>Household educational attainment</i>				
Less than high school (%)	15.33	9.16***	14.47***	11.12***
High school graduate/GED (%)	40.23	23.29	24.54	29.28
More than high school (%)	44.44	67.55	60.98	59.60
Two-parent household (%)	50.00	75.71***	74.88***	62.82***
Safe neighborhood (%)	59.55	86.09***	83.98***	84.38***
Black, non-Hispanic race/ethnicity (%)	50.00	13.32***	14.57***	39.66***
Male (%)	50.00	51.13	50.88	51.07
<i>Child age</i>				
0–5 years (%)	29.34	33.19*	34.95*	33.16
6–11 years (%)	29.65	32.42	32.45	32.51
12–17 years (%)	41.01	34.39	32.59	34.33
Fair/poor physical health (%)	16.93	3.44***	5.50***	4.83***
Insured (%)	81.73	90.84***	84.25	93.09***

* $p < 0.05$; ** $p < 0.01$;
*** $p < 0.001$ compared to G-CAFH sample. To conduct multiple comparisons, a Bonferroni correction can be used at a conservative alpha level of 0.01

the G-CAFH children and those in Alabama/Texas; however, the NSCH national and Louisiana/Mississippi children were more likely to be insured than the G-CAFH children. G-CAFH children were slightly older than the national and Alabama/Texas children, but not significantly so compared to Louisiana/Mississippi. There were no gender differences.

The traditional logistic regression estimated the unadjusted odds of having a personal healthcare provider among G-CAFH children ranged from 79 % lower than Alabama/Texas children to 85 % lower than the national group (Table 2). Living in poverty, limited household education, not living with two parents, Black non-Hispanic race/ethnicity, and being uninsured were significantly associated with a lower likelihood of having a personal provider across the three comparisons. Older children were less likely to have a provider in the national and Alabama/Texas comparisons. Safe neighborhoods were positively

associated in the national and Louisiana/Mississippi groups. Child health was associated with having a provider in the national comparison only. Gender was not associated with the outcome in any analysis.

The adjusted odds that a G-CAFH child exposed to the damage and/or displacement of Hurricane Katrina had a personal doctor or nurse was approximately 70 % lower than the odds of NSCH children (Table 2). The odds ratios were as follows: national OR = 0.28 (0.21, 0.39), Alabama/Texas OR = 0.34 (0.20, 0.56), and Louisiana/Mississippi OR = 0.32 (0.22, 0.47). Poverty, Black race/ethnicity, and lack of insurance were consistently associated with a lower likelihood of having a personal provider after controlling for the other covariates. Educational attainment was positively associated with the outcome in the national and Louisiana/Mississippi comparisons, while age was negatively associated in the national and Alabama/Texas analyses. Living in a safe neighborhood was

Table 2 Unadjusted and adjusted odds of having a personal healthcare provider: traditional approach

	US excl LA/MS		AL/TX		LA/MS	
	OR	95 % CI	OR	95 % CI	OR	95 % CI
<i>Unadjusted estimates</i>						
Katrina damage and displacement (G-CAFH vs. NSCH)	0.15***	(0.12, 0.20)	0.21***	(0.15, 0.30)	0.20***	(0.15, 0.27)
Living below 100 % 2007 FPL (vs. ≥ 100 % FPL)	0.41***	(0.35, 0.47)	0.40***	(0.25, 0.64)	0.34***	(0.24, 0.48)
Less than high school education (vs. some college)	0.27***	(0.23, 0.33)	0.33**	(0.18, 0.59)	0.31***	(0.19, 0.50)
High school graduate/GED (vs. some college)	0.45***	(0.39, 0.53)	0.46**	(0.27, 0.78)	0.40***	(0.27, 0.58)
Two-parent household (vs. single parent/other)	1.61***	(1.40, 1.85)	1.66*	(1.02, 2.71)	2.14***	(1.53, 3.00)
Safe neighborhood (vs. unsafe neighborhood)	1.86***	(1.58, 2.20)	1.40	(0.78, 2.50)	1.85**	(1.19, 2.88)
Black, non-Hispanic (vs. White/Hispanic/other)	0.65***	(0.55, 0.77)	0.43**	(0.25, 0.74)	0.35***	(0.25, 0.49)
Male (vs. female)	0.91	(0.80, 1.04)	1.38	(0.88, 2.19)	1.19	(0.85, 1.66)
Age: 6–11 years (vs. 0–5 years)	0.81**	(0.68, 0.95)	0.65	(0.35, 1.21)	1.17	(0.74, 1.85)
Age: 12–17 years (vs. 0–5 years)	0.69***	(0.59, 0.80)	0.51*	(0.29, 0.92)	0.75	(0.50, 1.11)
Fair/poor physical health (vs. good–excellent health)	0.44***	(0.32, 0.62)	0.75	(0.28, 2.02)	0.75	(0.34, 1.67)
Insured (vs. uninsured)	5.18***	(4.42, 6.06)	6.70***	(4.09, 10.97)	3.83***	(2.48, 5.93)
<i>Adjusted estimates</i>						
Katrina damage and displacement (G-CAFH vs. NSCH)	0.28***	(0.21, 0.39)	0.34***	(0.20, 0.56)	0.32***	(0.22, 0.47)
Living below 100 % 2007 FPL (vs. ≥ 100 % FPL)	0.67***	(0.56, 0.80)	0.52*	(0.31, 0.89)	0.52**	(0.33, 0.81)
Less than high school education (vs. some college)	0.48***	(0.38, 0.60)	0.62	(0.31, 1.23)	0.54*	(0.31, 0.93)
High school graduate/GED (vs. some college)	0.61***	(0.51, 0.73)	0.63	(0.35, 1.13)	0.56**	(0.38, 0.83)
Two-parent household (vs. single parent/other)	1.11	(0.94, 1.32)	0.94	(0.52, 1.72)	0.92	(0.59, 1.43)
Safe neighborhood (vs. unsafe neighborhood)	1.31**	(1.08, 1.58)	0.89	(0.45, 1.77)	1.21	(0.77, 1.91)
Black, non-Hispanic (vs. White/Hispanic/other)	0.76**	(0.62, 0.93)	0.43*	(0.22, 0.84)	0.46***	(0.31, 0.68)
Male (vs. female)	0.93	(0.80, 1.06)	1.39	(0.86, 2.24)	1.11	(0.78, 1.57)
Age: 6–11 years (vs. 0–5 years)	0.83*	(0.69, 0.99)	0.67	(0.33, 1.36)	1.35	(0.84, 2.19)
Age: 12–17 years (vs. 0–5 years)	0.72***	(0.61, 0.85)	0.48*	(0.26, 0.92)	0.79	(0.53, 1.18)
Fair/poor physical health (vs. good–excellent health)	0.83	(0.58, 1.20)	1.91	(0.71, 5.12)	1.61	(0.68, 3.81)
Insured (vs. uninsured)	4.21***	(3.54, 5.01)	5.94***	(3.45, 10.22)	3.77***	(2.47, 5.74)

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

The traditional approach used logistic regression models to compare children from the G-CAFH study with three NSCH groups

significantly associated with having a provider in the national comparison only. Household structure, health and gender were not associated with the outcome.

Propensity Score Analysis

The propensity score analysis showed a negative, but weaker, association between Katrina exposure and having a personal healthcare provider (Table 3; the adjusted logistic regression estimates were included for comparison). The 3-variable estimates of Katrina's effect were 0.80 (0.76, 0.40) in the national comparison, 0.79 (0.75, 0.84) compared to Alabama/Texas, and 0.80 (0.76, 0.85) when limited to Louisiana/Mississippi, after adjusting for the covariates. The 5-variable adjusted estimates were comparable at 0.81 in all three analyses with similar 95 % confidence intervals.

Sensitivity Analysis

The *psmatch2* algorithm gave slightly higher estimates of effect compared to the *pscore* and *attnd* procedures. When using the same specifications as the original analyses (with replacement and without calipers), the estimates were 0.84 (0.77, 0.91) for the national comparison, 0.81 (0.75, 0.88) for Alabama/Texas, and 0.86 (0.79, 0.93) in Louisiana/Mississippi. The estimates remained consistent with caliper widths of 0.05, 0.01 or 0.001, and without replacement.

The effect estimates were 0.83–0.84 in the US comparison, 0.81–0.82 in Alabama/Texas, and 0.84–0.86 in Louisiana/Mississippi ($p < 0.05$).

Discussion

In the wake of Hurricane Katrina, a number of time-limited interventions were launched to assure medical care access for exposed children (e.g., Disaster Relief Medicaid). Both the traditional and propensity score analyses conducted here revealed that Katrina-exposed children were less likely to have access to a personal healthcare provider than were comparable children. The propensity score analysis suggested that the exposed children were only 20 % less likely to have provider access, in contrast to the traditional regression which estimated that exposed children were approximately 70 % less likely to have such access. The more precise matching of the propensity analysis may have done a better job of estimating the effect of exposure and addressing potential confounding effects. The propensity score results were considered superior due to the detailed assessment of covariate balance within the matched groups, and the consistency of the estimates. Regardless of the propensity score used (3- or 5-variable) or the specifications, the effect estimates showed little variation.

In previous work, the one-to-many matching of the propensity score approach has led to different effect estimates

Table 3 Adjusted effect of exposure on having a personal healthcare provider: propensity score matching versus logistic regression

	US excl LA/MS	AL/TX	LA/MS
<i>Traditional logistic regression method^a</i>			
Adjusted odds ratio (95 % CI)	0.28 (0.21, 0.39)***	0.34 (0.20, 0.56)***	0.32 (0.22, 0.47)***
<i>Propensity score method—3 variables^b</i>			
Number of matched exposed (G-CAFH)	255	255	255
Number of matched unexposed (NSCH)	87,608	3,552	3,772
<i>Propensity score method</i>			
Adjusted odds ratio ^c (95 % CI)	0.80 (0.76, 0.84)***	0.79 (0.75, 0.84)***	0.80 (0.76, 0.85)***
<i>Propensity score method—5 variables^d</i>			
Number of matched exposed (G-CAFH)	253	253	253
Number of matched unexposed (NSCH)	83,487	3,335	3,544
<i>Propensity score method</i>			
Adjusted odds ratio ^c (95 % CI)	0.81 (0.76, 0.85)***	0.81 (0.77, 0.86)***	0.81 (0.77, 0.86)***

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

^a OR adjusted for poverty level, household educational attainment, household structure, neighborhood safety, race/ethnicity, gender, age, child health, and insurance

^b Propensity score calculated with poverty level, household educational attainment, and race/ethnicity. Estimate of effect adjusted for household structure, neighborhood safety, gender, age, child health, and insurance

^c Derived from the average effect of the treatment on the treated (ATT)

^d Propensity score calculated with poverty level, household educational attainment, race/ethnicity, gender and age. Estimate of effect adjusted for household structure, neighborhood safety, child health, and insurance

than those from regression analyses [38]. In this study, however, matching without replacement (i.e., one-to-one matching) yielded comparable results indicating the differing estimates were more likely due to increased exchangeability of the two groups rather than the sample weights.

There were several limitations to this analysis. Propensity score matching can only control for confounding due to measured covariates. Despite controlling for many covariates, residual confounding by unmeasured factors may remain. Misclassification of exposure among the NSCH children was also a concern; nevertheless, the findings were consistent across comparison groups making it unlikely that misclassification affected the results. Some covariate imbalance was retained in the 5-variable matched blocks; however, the estimates of effect remained strikingly similar. Previous research has demonstrated moderate imbalances can persist even when the propensity-score model has been correctly specified [40, 59], so the residual imbalance was not expected to invalidate the findings.

The outcome variable in this analysis was limited to having a personal doctor or nurse. Further research on other medical home components is encouraged. Additionally, the two-year timeframe may have been insufficient for exposed families to reestablish ties with former or new healthcare providers. However, the 2007 G-CAFH data were thought to be most appropriate because they were collected in the same year as NSCH data.

Overall, the NSCH data provided a population-based comparison group for the G-CAFH cohort without which the analyses presented here would not have been possible. This research emphasizes the importance of expanding utilization of such datasets to allow smaller datasets to make greater contributions to current knowledge of children's health and well-being.

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