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The Medical Home: Health Care Access and Impact for Children and Youth in the United States

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The Medical Home: Health Care Access and Impact for Children and Youth in the United States

WHAT'S KNOWN ON THIS SUBJECT: The medical home is recognized as a mechanism for ensuring quality health care for children with special health care needs and adults with chronic conditions. Few studies address the extent to which all children have a medical home.

WHAT THIS STUDY ADDS: This article provides a comprehensive assessment of the proportion of children who have a medical home, the health and social correlates of having a medical home, and its impact on receipt of preventive care and unmet need.

abstract

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OBJECTIVE: The medical home concept encompasses the elements of pediatric care considered essential for all children. We describe here the characteristics of children with medical homes and the relationship between presence of a medical home and selected health care outcomes by using new data from the 2007 National Survey of Children's Health (NSCH).

METHODS: We used a medical home measure comprising 5 components: having a usual source of care; having a personal physician or nurse; receiving all needed referrals for specialty care; receiving help as needed in coordinating health and health-related care; and receiving family-centered care. A total of 83 448 children aged 1 to 17 years had valid data for all applicable medical home components. The NSCH is a random-digit-dial population-based telephone survey.

RESULTS: In 2007, 56.9% of US children aged 1 to 17 years received care in medical homes. Younger children were more likely to have a medical home than their older counterparts. Substantial racial/ethnic, socioeconomic, and health-related disparities were present. Children who received care in medical homes were less likely to have unmet medical and dental needs and were more likely to have annual preventive medical visits.

CONCLUSIONS: Approximately half of the children in the United States have access to all components of a pediatric medical home. Because the medical home is increasingly promoted as the standard for provision of high-quality comprehensive health care, these findings reinforce the need to continue and expand federal, state, and community efforts to ensure that all children have access to this model of care. *Pediatrics* 2011;127:604–611

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KEY WORDS

community pediatrics, health care delivery/access, quality of care, health outcomes, health policy, medical home, children

ABBREVIATIONS

AAP —American Academy of Pediatrics
CSHCN—children with special health care needs
NSCH—National Survey of Children's Health

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The medical home concept encompasses the characteristics of pediatric care considered essential for all children.[1,2] The American Academy of Pediatrics (AAP) developed and has championed the medical home concept for decades,[3] and currently defines the medical home as a model of primary care that is accessible, continuous, comprehensive, family centered, coordinated, compassionate, and culturally effective.[1]

The medical home has received widespread national attention as a mechanism for ensuring quality in health care for children with special health care needs (CSHCN)[4–10] and more recently for adults with chronic conditions.[11–13] Families, child health professionals, policy makers, and insurers endorse this model as a standard of care[1,2,14–17] and it now serves as a centerpiece for national quality assurance measures.[18] Although existing research on the pediatric population supports a positive relationship between some components of the medical home and desired child and family health-related outcomes, few studies have incorporated a medical home definition reflecting the comprehensive elements articulated by the AAP[19] or studied the extent to which the medical home is available to the pediatric population as a whole.[20] Furthermore, to our knowledge, none have studied the association between having a medical home and receipt of other important components of health such as dental care.

The purpose of this article was to provide an up-to-date, population-based assessment of medical home access for all children using a comprehensive definition and to describe the relationship between presence of a medical home and receipt of preventive medical and dental care, and unmet medical and dental needs. Dental care is included because existing policy guidelines and experts promote the integration of oral health services in the medical home.[21–27]

METHODS

Data Set

The 2007 National Survey of Children's Health (NSCH) is a random-digit-dial population-based telephone survey designed and directed by the Health Resources and Services Administration's Maternal and Child Health Bureau and conducted by the Centers for Disease Control and Prevention's National Center for Health Statistics, using the State and Local Area Integrated Telephone Survey mechanism.[28] Interviews were completed in 66.0% of identified households with children. A total of 91 642 interviews were conducted in households with children ages birth through 17 years between April 2007 and July 2008. The survey was administered for 1 randomly selected child in each household with an age-eligible child. The parent or guardian who knew the most about the health and health care of the selected child served as the respondent for the interview. Because many of the survey items used in this analysis encompassed a 1-year recall period, we restricted our analysis to children aged 1 to 17 years rather than 0 to 17 years.

Medical Home Measurement

The medical home measure used here was designed to approximate the components of the AAP-defined medical home concept and is the most robust, comprehensive measure used in a national survey.[19,29] With the exception of the element of "continuity," all elements of the AAP medical home measure are addressed through the NSCH medical home measure. The cross-sectional nature of the NSCH creates methodologic barriers to measuring continuity of care over time. The NSCH medical home measure is a composite of 5 components: having a usual source of care, having a personal physician or nurse, receiving all needed referrals for specialty care, receiving needed help coordinating health and health-related care, and receiving family-centered care. Each component was operationalized using $\geq$1 survey items. For example, the family-centered care component was measured by using 6 items: (1) whether the family reports that the child's physicians spend enough time with the child; (2) whether physicians listen carefully to family concerns; (3) whether physicians are sensitive to family values and customs; (4) whether physicians provide needed information; (5) whether physicians make the family feel like a partner in the child's care; and (6) whether interpretation services are available, if needed. If the respondent answered "usually" or "always" to each item, the child was considered to have received family-centered care. A similar process was used to operationalize the other 4 components of the medical home. The components and subcomponents of the medical home measure are included in Table 1.

It should be noted that the components do not apply universally to all children in the sample. Specifically, the component on receiving referrals applies only to children who were reported to need referrals (n = 14 349). Similarly, the component on receiving effective care coordination applies only to children reported to need care coordination (n = 36 889) and the component on receipt of family-centered care applies only to children with at least 1 physician visit in the past year (n = 82 354). To qualify as successfully attaining the medical home, all applicable components must be met. A success rate was calculated by dividing the number of children whose providers delivered all applicable compo-

TABLE 1 Components and Subcomponents of a Medical Home: Number of Children Aged 1 to 17 Years With Valid Data

	Valid *n*	Not Ascertained, *n*
Child had a usual source of care	86 686	187
Child had a personal physician or nurse	86 625	248
Child had no problems obtaining referrals when needed[a]	14 349	269
Child received effective care coordination[b]	36 889	980
Family was very satisfied with physicians' communication with each other[b,c]	25 502	82
Family was very satisfied with physicians' communication with other programs[b]	9965	641
Family usually or always received sufficient help coordinating care, if needed[b]	17 252	291
Child received family-centered care[d]	82 354	
Physicians usually or always spent enough time[d]	83 761	722
Physicians usually or always listened carefully[d]	83 929	554
Physicians were usually or always sensitive to values and customs[d]	83 662	821
Physicians usually or always provided needed information[d]	83 874	609
Physicians usually or always made the family feel like a partner[d]	83 944	539
An interpreter was usually or always available when needed[d,e]	1800	7

Valid *n* indicates the unweighted sample size with nonmissing data. "Not ascertained" includes children for whom a response was refused or was not known by the respondent.

[a] This component was ascertained only for children who needed a referral during the previous year to see a physician or receive a service.

[b] This component was ascertained for children who used >1 type of health care service during the previous year.

[c] Communication with other health care professionals was reported only for children who used specialty care; physical, occupational, or speech therapy; mental health care; substance abuse treatment; and/or home health care during the previous year.

[d] This component was ascertained only for children with ≥1 physician visits during the previous year.

[e] Availability of interpreters was ascertained only for children who lived in homes in which the primary language spoken was not English and who needed an interpreter during the previous year.

nents by the total number of children with valid data. When questions on the referrals, care coordination, and family-centered care components were legitimately skipped, then the child was included in the analysis and classified as having a medical home on the basis of responses to the remaining components. Analyses excluded children with missing data. A total of 83 448 children had valid data for all applicable components of the medical home.

Outcome Variables

The impact of having a medical home was measured by using 4 variables meant to capture the spectrum of health care experiences associated with difficulty accessing medical and dental care, and timely receipt of routine preventive medical and dental care. The variables used to measure these concepts were having an unmet medical need, not receiving a preventive medical care visit, having an unmet dental need, and not receiving a preventive dental care visit.

Statistical Analysis

Presence of a medical home was computed for children according to the demographic, social, and health status variables described here. The χ^2 statistic was used to test bivariate associations between each covariate and prevalence of a medical home. The independent effects of the medical home on the outcome variables were ascertained using logistic regression analyses that controlled for confounders. Confounding variables were selected on the basis of Andersen's health behavior model.[30] Predisposing variables included age, gender, race/ethnicity, primary language spoken at home, mother's educational attainment, perception of neighborhood safety, region, and urban/rural residence. Need variables included perceived health status and perceived oral health (dental outcomes only). Enabling variables included household poverty status and the child's health insurance coverage status at the time of the interview.

SUDAAN software (Research Triangle Institute, Research Triangle Park, NC) was used to conduct all analyses with the weighted survey data, adjusted for the complex, multistage sample design. Unless otherwise indicated, all differences described in the text are significant at the ≤.05 level.

RESULTS

Correlates of Success in Medical Home Attainment

Table 1 lists the 5 components and 9 subcomponents of the medical home measure and the number of cases with valid data for each component among children aged 1 to 17 years. Table 2 lists the proportion of children with a medical home and each of the 5 components of the medical home. Nationally, 56.9% of children aged 1 to 17 years had a medical home in 2007. Much higher proportions of children met the individual components: 93.1% of children had a usual source of care, 92.1% had a personal physician or nurse, 81.9% of children had no problems in obtaining referrals when needed, 68.8% received effective care coordination when needed, and 66.7% of children received family-centered care.

Substantial differences in medical home attainment rates are apparent across demographic, socioeconomic, and health characteristics. Younger children were more likely to have medical homes than their older counterparts, whereas no significant differences were found for gender. There are large racial and ethnic disparities; non-Hispanic white children had the highest attainment rate, and Hispanic children had the lowest. Non-Hispanic

TABLE 2 Percentage of Children Aged 1 to 17 Years With a Medical Home and Its 5 Components Grouped According to Selected Demographic, Socioeconomic, and Health Characteristics: United States, 2007

	Had a Medical Home Overall		Had a Usual Source of Care		Had a Personal Physician/Nurse		Had No Problem Obtaining Referrals When Needed		Received Effective Care Coordination When Needed		Received Family-Centered Care	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Total population	56.9	0.4	93.1	0.3	92.1	0.2	81.9	0.8	68.8	0.6	66.7	0.4
Age, y												
1–5	63.2	0.8	93.8	0.5	93.5	0.4	85.3	1.4	70.7	1.3	72.4	0.8
6–11	55.2	0.8	92.9	0.5	92.2	0.4	78.1	1.7	67.3	1.1	64.8	0.8
12–17	53.4	0.7	92.7	0.4	90.9	0.4	82.5	1.1	68.9	0.9	63.9	0.7
Gender												
Male	56.3	0.6	92.9	0.3	91.9	0.3	83.1	0.9	68.0	0.9	66.7	0.6
Female	57.6	0.6	93.3	0.4	92.3	0.4	80.5	1.4	69.7	0.9	66.7	0.6
Race/ethnicity												
Hispanic	37.9	1.3	85.3	0.9	85.4	0.9	75.0	2.7	60.8	1.9	48.1	1.4
Non-Hispanic white	67.3	0.5	96.8	0.2	95.4	0.2	84.9	1.0	73.4	0.7	76.9	0.4
Non-Hispanic black	43.9	1.1	89.7	0.7	88.9	0.7	78.1	2.5	62.3	1.7	54.1	1.1
Non-Hispanic multiracial	62.4	2.1	94.9	0.9	92.8	0.9	80.1	2.9	70.3	2.4	73.9	1.9
Other	47.3	2.3	92.1	1.4	90.5	1.5	83.0	2.6	65.6	3.1	53.8	2.4
Primary language spoken at home												
English	60.9	0.4	94.8	0.2	93.6	0.2	82.8	0.9	70.1	0.6	70.9	0.4
Any other	28.6	1.5	81.4	1.2	82.0	1.2	70.1	3.3	59.7	2.4	36.1	1.7
Region												
Northeast	59.7	0.8	95.2	0.4	95.3	0.4	83.4	1.4	69.6	1.2	69.3	0.8
Midwest	61.7	0.6	94.8	0.3	93.2	0.3	85.3	1.1	70.7	0.9	71.1	0.6
South	55.6	0.7	92.7	0.4	91.3	0.4	82.1	1.1	69.3	0.9	65.4	0.7
West	52.4	1.3	90.7	0.8	90.0	0.7	77.4	2.7	65.7	1.9	62.6	1.3
Location												
Urban	56.1	0.6	92.8	0.3	92.1	0.3	81.2	1.0	68.2	0.8	65.8	0.5
Rural	58.9	0.9	93.7	0.5	91.7	0.6	84.4	1.6	71.7	1.3	68.6	0.9
Neighborhood is perceived as safe												
Yes	60.3	0.5	93.9	0.3	92.9	0.3	84.2	0.9	71.3	0.7	70.3	0.5
No	36.5	1.2	88.7	0.8	87.5	0.8	69.6	2.5	54.8	1.9	44.9	1.3
Mother's education												
<High school	33.9	1.5	80.7	1.4	83.6	1.0	72.9	3.2	63.0	2.4	44.9	1.7
High school	51.4	0.9	92.0	0.5	90.2	0.6	81.2	1.8	66.6	1.4	60.1	1.0
>High school	64.9	0.5	96.4	0.2	94.9	0.2	83.7	1.0	71.6	0.7	74.3	0.5
Household poverty status												
≥400% FPL	68.8	0.7	97.1	0.4	96.8	0.3	88.1	0.9	74.3	1.0	78.0	0.7
200%–399% FPL	61.6	0.8	95.2	0.4	94.2	0.3	83.4	1.8	71.6	1.1	71.3	0.8
100%–199% FPL	48.8	1.1	91.4	0.6	88.5	0.7	78.5	2.0	63.5	1.7	58.4	1.1
<100% FPL	38.6	1.1	85.0	0.9	85.2	0.7	71.8	2.1	60.2	1.6	48.9	1.2
Health insurance												
Currently insured	59.1	0.5	94.5	0.2	93.9	0.2	82.9	0.8	70.0	0.6	68.7	0.5
Not currently insured	35.1	1.5	79.2	1.4	74.9	1.3	66.7	4.7	50.7	2.6	44.2	1.7
Perceived status of the child's overall health												
Excellent or very good	61.2	0.5	94.4	0.3	93.3	0.2	83.8	1.0	72.9	0.6	70.3	0.5
Good	36.5	1.4	86.1	1.0	86.3	0.9	78.1	1.8	57.3	1.9	48.5	1.4
Fair or poor	24.9	2.6	85.8	2.0	84.5	2.2	68.6	3.7	45.4	3.4	42.2	3.0
Perceived status of the child's oral health[a]												
Excellent or very good	63.1	0.5	95.0	0.3	94.1	0.3	84.3	1.0	73.8	0.7	72.3	0.5
Good	43.1	1.0	89.0	0.7	88.2	0.6	78.3	2.0	61.4	1.5	54.8	1.1
Fair or poor	34.9	1.8	87.5	1.2	83.7	1.4	70.4	3.0	51.1	2.6	42.9	1.9

FPL indicates federal poverty level.

[a] Children aged 2 to 17 years only.

black children fared only modestly better than Hispanic children. Prevalence of medical homes was twofold higher for children in families in which English was the primary language compared with children in families in which other languages were primarily spoken.

Where a child lives was also related to attainment of a medical home. Attainment rates were highest in the Midwest and lowest in the West. Although

only a modest difference was found in attainment rates for children living in urban and rural areas, children who lived in neighborhoods considered "safe" by their parents were much more likely to have medical homes than children whose parents did not consider their neighborhood to be safe.

Strong gradients are apparent for the 2 measures of socioeconomic status in Table 2. Maternal educational attainment beyond high school conferred a twofold advantage in the likelihood of having a medical home compared with mothers with less than a high school education. Children in families with incomes at <100% of the federal poverty level were only about half as likely to meet the criteria for having a medical home as children in families with incomes at ≥400% of the federal poverty threshold. In addition, uninsured children were about half as likely as insured children to have a medical home. Finally, children who were reported to be in excellent or very good overall health, as perceived by their parents, were more than twice as likely to have medical homes as their counterparts in fair or poor health. A similar, but less steep, gradient exists for parent-reported oral health.

Recognizing that many of the demographic, socioeconomic, and health characteristics listed in Table 2 are correlated, we also examined whether the bivariate results retained their significance after multivariable analysis. Comparison of the unadjusted and adjusted odds ratios in Table 3 reveals some attenuation of effect sizes for most of the associated factors. However, the adjusted results, which show the independent effect of each covariate on the likelihood of having a medical home, remain significant with the exception of region and residential location.

TABLE 3 Unadjusted and Adjusted Odds of Not Having a Medical Home Grouped According to Selected Demographic, Socioeconomic, and Health Characteristics for Children Aged 1 to 17 years: United States, 2007

	Did Not Have a Medical Home			Did Not Have a Medical Home		
	OR	95% CI	*P*	aOR[a]	95% CI	*P*
Age, y						
1–5	1.0	—	.00	1.0	—	.00
6–11	1.4	1.3–1.5		1.5	1.3–1.6	
12–17	1.5	1.4–1.6		1.6	1.5–1.8	
Gender						
Male	1.0	—	.15	1.0	—	.15
Female	1.1	1.0–1.1		1.1	1.0–1.1	
Race/ethnicity						
Non-Hispanic white	1.0	—	.00	1.0	—	.00
Hispanic	3.4	3.0–3.8		1.6	1.4–1.9	
Non-Hispanic black	2.6	2.4–2.9		1.9	1.7–2.1	
Non-Hispanic multiracial	1.2	1.0–1.5		1.1	0.9–1.4	
Other	2.3	1.9–2.8		1.9	1.5–2.2	
Primary language spoken at home						
English	1.0	—	.00	1.0	—	.00
Any other language	3.9	3.4–4.5		1.7	1.4–2.1	
Region						
Northeast	1.0	—	.00	1.0	—	.11
Midwest	0.9	0.9–1.0		1.0	0.9–1.1	
South	1.2	1.1–1.3		1.0	0.9–1.1	
West	1.4	1.2–1.5		1.1	1.0–1.3	
Location						
Urban	1.0	—	.00	1.0	—	.92
Rural	0.9	0.8–0.9		1.0	0.9–1.1	
Neighborhood is perceived as safe						
Yes	1.0	—	.00	1.0	—	.00
No	2.6	2.4–2.9		1.7	1.5–1.9	
Mother's education						
>High school	1.0	—	.00	1.0	—	.00
High school	1.8	1.6–1.9		1.2	1.1–1.3	
<High school	3.6	3.2–4.1		1.5	1.3–1.7	
Household poverty status						
≥400% FPL	1.0	—	.00	1.0	—	.00
200%–399% FPL	1.4	1.3–1.5		1.2	1.1–1.3	
100%–199% FPL	2.3	2.1–2.6		1.4	1.3–1.6	
<100% FPL	3.5	3.1–3.9		1.6	1.4–1.8	
Health insurance						
Currently insured	1.0	—	.00	1.0	—	.00
Not currently insured	2.7	2.3–3.1		1.8	1.5–2.0	
Perceived status of the child's overall health						
Excellent or very good	1.0	—	.00	1.0	—	.00
Good	2.7	2.4–3.1		1.7	1.5–1.9	
Fair or poor	4.8	3.6–6.3		2.6	2.0–3.4	
Perceived status of the child's oral health[b]						
Excellent or very good	1.0	—	.00	1.0	—	.00
Good	2.3	2.1–2.5		1.4	1.3–1.5	
Fair or poor	3.2	2.7–3.8		1.4	1.2–1.7	

OR indicates odds ratio; aOR, adjusted odds ratio; CI, confidence interval; *P*, *P* value for Wald F statistic; FPL, federal poverty level.

[a] Adjusted for age, gender, race/ethnicity, primary language spoken at home, mother's education attainment, region, urban/rural residence, child's overall health, household poverty status, and health insurance coverage status.

[b] Children aged 2 to 17 years. Adjusted analysis of the other covariates did not include this variable.

Impact on Medical Care and Dental Care

Table 4 reveals the impact of having a medical home on access and use of medical and dental care. Unmet medical care needs were reported for 3.7% of children. A significantly greater percentage of children without a medical

TABLE 4 Impact of Medical Home on Unmet Medical and Dental Needs and Preventive Care Among Children Aged 1 to 17 Years ($N = 83\,448$): NSCH, 2007

	Having an Unmet Medical Need	Not Receiving a Preventive Medical Care Visit	Having an Unmet Dental Need[a]	Not Receiving a Preventive Dental Care Visit[a]
Total, % (SE)	3.7 (0.2)	11.7 (0.3)	2.9 (0.15)	17.4 (0.4)
Medical home, % (SE)				
Yes	1.6 (0.2)	9.9 (0.3)	1.5 (0.12)	16.6 (0.5)
No	6.4 (0.4)	14.0 (0.5)	4.8 (0.31)	18.4 (0.6)
Medical home, aOR (95% CI); *P*				
Yes	1.0; .00[b]	1.0; .00[b]	1.0; .00[c]	1.0; .04[c]
No	3.8 (2.9–5.1)	1.2(1.1–1.4)	2.6(2.1–3.2)	0.9 (0.8–1.0)

aOR indicates adjusted odds ratio; CI, confidence interval; *P*, *P* value for Wald F statistic.

[a] Children aged 2 to 17 years.

[b] Adjusted for age, gender, race/ethnicity, primary language spoken at home, mother's education attainment, region, urban/rural residence, child's overall health, household poverty status, and health insurance coverage status.

[c] Adjusted for previously stated covariates and perceived oral health status.

home (6.4%) were reported as having an unmet health care need than children with a medical home (1.6%). The adjusted analysis shows that children without a medical home had almost 4 times the odds of having unmet health care needs as children who have a medical home. Overall, 11.7% of children did not receive a preventive care visit in the past year. Children without medical homes were more likely than children with a medical home to have gone without a visit (14.0% vs 9.9%). This difference remained significant in the adjusted analysis, as shown in the lower half of the table.

The association between presence of a medical home and dental care is shown in the last 2 columns of Table 4. The prevalence of unmet dental care needs was 2.9% for all children. Those without a medical home were 3 times more likely to have unmet dental needs than those with medical homes (4.8% vs 1.5%). After adjusting for potential confounders, absence of a medical home was associated with nearly threefold higher odds of having an unmet dental care need. Overall, 17.4% of children did not have a preventive dental visit in the past year. On an unadjusted basis, children without medical homes were slightly more likely than those with medical homes to go without preventive dental care (16.6% vs 18.4%); however, this relationship reversed in the adjusted analysis.

DISCUSSION

The medical home is increasingly accepted as the standard for provision of high-quality comprehensive health care. The definition used here requires that children have not only a usual source of care and a personal physician or nurse, but also care that is family centered and provides ready access to referrals and care coordination when needed. These same principles are at the core of the AAP's definition of medical home.

Although many articles have assessed the prevalence and impact of medical homes for CSHCN,[6,31–33] few have done so for the pediatric population as a whole. The results presented here provide the most recent, comprehensive assessment of the proportion of US children who receive their care in medical homes, the health and social correlates of having a medical home, and the impact of medical homes on receipt of preventive care and presence of unmet health needs.

We found that most children had 1 or more of the 5 medical home components but only about half of children (56.9% of children aged 1–17 years, or ~38 million, nationally) had a medical home in 2007. Aspects of the patient-provider relationship (including access to needed referrals, care coordination, and receipt of family-centered care) remain problematic for many children. Strategies to address these bottlenecks include education and technical assistance for practice transformation, including improved care coordination, use of electronic medical records to monitor referrals and follow-up care, and shifting financial incentives to create greater parity in reimbursement of cognitive and procedure-oriented care.

Similar to findings from the 2003 NSCH,[20] we found significant disparities in receipt of care in medical homes by race and ethnicity and poverty. Among racial and ethnic groups, Hispanic children fared worse, followed closely by blacks. A strong gradient across poverty categories was also documented in our study. Although these racial/ethnic and income-related disparities attenuated when confounding variables were considered, they remained significant.

Notably, our analysis also revealed large disparities in access to medical homes across health status. Children who could conceivably benefit most (those reported in fair or poor health) were only half as likely as those rated in excellent or very good health to have a medical home. Together, these health and social disparities indicate a need to target interventions toward the most vulnerable children.

There may be additional benefits to improving access to medical homes for vulnerable populations, especially minority racial and ethnic groups. An analysis of the Commonwealth Fund's 2006 Health Care Quality Survey reported that health care settings with features of a medical home (including a regular source of care, enhanced access to physicians, and timely, well-organized care) can eliminate racial

and ethnic disparities in access to quality care.[11] Although that study used a narrow definition of medical home and included only adults, the findings suggest that expanding access to medical homes could improve quality and increase equity among children.

Insurance provides an important tool for reducing disparities by increasing access to medical homes. Our analysis revealed that insured children were almost twice as likely to have medical homes as uninsured children. In this regard, the new health care reform law[34] is particularly salient, containing several provisions that should increase access to medical homes. First, by 2014, all children will be required to have health insurance coverage. Given our finding that health insurance is highly correlated with medical home access, this provision alone should have a large impact on the proportion of children with medical homes. In addition, the new law provides for raising Medicaid reimbursement rates for primary care to current Medicare levels. That substantial boost in payment rates should increase access to primary care and, by extension, medical homes for Medicaid-enrolled children. Other health care reform provisions, including requiring private insurance plans to provide preventive care according to the *Bright Futures* guidelines[23] at no out-of-pocket expense to enrollees, will also support the medical home movement.

Our study found strong associations between presence of a medical home and unmet health care needs. Even after adjusting for confounding variables, lacking a medical home was associated with a three- to fourfold increased risk of having an unmet need for medical or dental care. These results add to the growing body of evidence supporting the medical home as a model of comprehensive health care for children. However, although we found a small salutatory effect of medical home on receipt of preventive medical care, the association was not as strong as expected. The modest effect size suggests that medical home providers may need to use new strategies to ensure that children receive routine preventive care at recommended intervals.

Surprisingly, presence of a medical home was inversely related to receipt of preventive dental care after adjusting for other variables, albeit the effect was small and only marginally significant. This finding may reflect the significant shortage of dentists providing preventive oral health services to young children[25] as well as the fact that incorporating preventive oral health care in the medical home, although recommended, is not yet a common practice for most physicians.[25–27,35] Although the medical home may play a significant role in assuring that children receive appropriate referral and follow-up for dental problems, it does not seem to be influential in assuring receipt of recommended preventive oral health care. Parents may be unaware of professional guidelines for preventive oral health care and thus may neither seek nor expect these services from the medical home.

Compared with previous studies of CSHCN, we found similar disparity patterns in access to a medical home as well as benefits in the form of lower rates of delayed care and unmet needs associated with care in a medical home setting.[6] The main difference in findings relates to the prevalence of medical homes. Perhaps because they place more demands on the health care system, CSHCN are less likely than children in general to have care that meets all of the components of the medical home.

There are limitations to this study. First, the 5 components used here to define a medical home, although designed to align with the main components of the AAP definition, are not identical; they are operational approximations.[19,29] In particular, the element of continuity included in the AAP definition of medical home cannot be assessed because of the methodologic difficulties of measuring continuity of care over time in a reliable way using cross-sectional data.[29] Second, the NSCH is based on parent report, which is both a limitation and strength. Although the estimates provided are limited by the knowledge and recollection of the parent, these data represent a consumer-based national measurement of the medical home concept. Third, some children are underrepresented or not represented in the survey, including those in institutional settings, homeless, or in migrant families, and those without landline telephones. Adjustments in the sample weights are made to account for these differences. Finally, because of the cross-sectional nature of the survey data set, we are limited in drawing causal inferences from the data. Many of these limitations could be addressed through thoughtfully designed longitudinal comparison studies of children receiving care in medical homes and traditional practice settings.

CONCLUSIONS

Overall, slightly more than half of US children receive their care in medical homes. Receipt of care in medical homes is shown here to be associated with reduced access problems for medical and dental care. These findings reinforce the need to continue and expand federal, state, and community efforts to ensure that all children have access to a medical home. Given the presence of socioeconomic, racial/ethnic, and health disparities in receipt of care in medical homes, targeted initiatives addressing disadvantaged segments of the child population are needed.

REFERENCES

1. American Academy of Pediatrics, Medical Home Initiatives for Children With Special Needs Project Advisory Committee. The medical home. *Pediatrics*. 2002;110(1 pt 1): 184–186
2. National Association of Pediatric Nurse Practitioners. NAPNAP position statement on pediatric health care/medical home: key issues on delivery, reimbursement, and leadership. *J Pediatr Health Care*. 2009; 23(3):A23–A24
3. Sia C, Tonniges TF, Osterhus E, Taba S. History of the medical home concept. *Pediatrics*. 2004;113(5 suppl):1473–1478
4. Cooley WC, McAllister JW, Sherrieb K, Kuhlthau K. Improved outcomes associated with medical home implementation in pediatric primary care. *Pediatrics*. 2009;124(1): 358–364
5. Homer CJ, Klatka K, Romm D, et al. A review of the evidence for the medical home for children with special health care needs. *Pediatrics*. 2008;122(4). Available at: www.pediatrics.org/cgi/content/full/122/4/e922
6. Strickland B, McPherson M, Weissman G, van Dyck P, Huang ZJ, Newacheck P. Access to the medical home: results of the National Survey of Children With Special Health Care Needs. *Pediatrics*. 2004;113(5 suppl):1485–1492
7. Kogan MD, Strickland, BB, Blumberg SJ, Singh GK, Perrin JM, van Dyck, PC. A national profile of the health care experiences and family impact of autism spectrum disorder among children in the United States, 2005–2006. *Pediatrics*. 2008;122(6). Available at: www.pediatrics.org/cgi/content/full/122/6/e1149
8. McAllister JW, Sherrieb K, Cooley WC. Improvement in the family-centered medical home enhances outcomes for children and youth with special healthcare needs. *J Ambul Care Manage*. 2009;32(3):188–196
9. Klitzner TS, Rabbitt LA, Chang RK. Benefits of care coordination for children with complex disease: a pilot medical home project in a resident teaching clinic. *J Pediatr*. 2010; 156(6):1006–1010
10. Palfrey JS, Sofis LA, Davidson EJ, Liu J, Freeman L, Ganz ML; Pediatric Alliance for Coordinated Care. The Pediatric Alliance for Coordinated Care: evaluation of a medical home model. *Pediatrics*. 2004;113(5 suppl): 1507–1516
11. Beal AC, Doty MM, Hernandez SE, et al. *Closing the Divide: How Medical Homes Promote Equitable Care: Results From the Commonwealth Fund 2006 Health Quality Survey*. New York, NY: Commonwealth Fund; 2007
12. Rosenthal TC. The medical home: growing evidence to support a new approach to primary care. *J Am Board Fam Med*. 2008; 21(5):427–440
13. Fields D, Leshen E, Patel K. Analysis & commentary: driving quality gains and cost savings through adoption of medical homes. *Health Aff (Millwood)*. 2010;29(5):819–826
14. Institute of Medicine, Committee on Quality of Health Care in America. *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington, DC: National Academy Press; 2000
15. Patient-Centered Primary Care Collaborative. Available at: www.pcpcc.net.
16. American Academy of Family Physicians; American Academy of Pediatrics; American College of Physicians; American Osteopathic Association. Joint principles of the patient-centered medical home. Available at: www.pcpcc.net/content/joint-principles-patient-centered-medical home. Accessed May 17, 2010
17. Albuquerque NM. Guide to Using the Family Centered Care Self Assessment Tool. Family Voices, Inc., 2008. Available at: http://dev.familyvoices.org/pub/projects/fcca_UsersGuide.pdf. Accessed February 19, 2011
18. National Committee for Quality Assurance. Patient-centered medical home. Available at: www.ncqa.org/tabid/631/Default.aspx. Accessed October 21, 2009
19. Bethell CD, Read D, Brockwood K. Using existing population-based data sets to measure the American Academy of Pediatrics definition of medical home for all children and children with special health care needs. *Pediatrics*. 2004;113(5 suppl):1529–1537
20. Raphael JL, Guadagnolo BA, Beal AC, Giardino AP. Racial and ethnic disparities in indicators of a primary care medical home for children. *Acad Pediatr*. 2009;9(4):221–227
21. Hale KJ; American Academy of Pediatrics, Section on Pediatric Dentistry. Oral health risk assessment timing and establishment of the dental home. *Pediatrics*. 2003;111 (5 pt 1):1113–1116
22. US Department of Health and Human Services. *Oral Health in America: A Report of the Surgeon General*. Rockville, MD: US Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health; 2000
23. American Academy of Pediatrics. *Bright Futures Guidelines for Health Supervision of Infants, Children, and Adolescents*. 3rd ed. Elk Grove Village, IL: American Academy of Pediatrics; 2008
24. American Academy of Pediatric Dentistry. Policy on the dental home. Available at www.aapd.org/media/Policies_Guidelines/P_DentalHome.pdf. Accessed May 17, 2010
25. Lewis CW, Boulter S, Keels MA, Krol DM, Mouradian WE, O'Connor KG, Quinonez RB. Oral health and pediatricians: results of a national survey. *Acad Pediatr*. 2009;9(6):457–461
26. Douglass AB, Douglass JM, Krol DM. Educating pediatricians and family physicians in children's oral health. *Acad Pediatr*. 2009; 9(6):452–456
27. Kenney MK. Oral health care in CSHCN: state Medicaid policy considerations. *Pediatrics*. 2009;124(suppl 4):S384–S391
28. Blumberg SJ, Foster EB, Frasier AM, et al. Design and operation of the National Survey of Children's Health, 2007. *Vital Health Stat 1*. National Center for Health Statistics. Available at: http://ftp.cdc.gov/pub/health_statistics/nchs/slaits/nsch07/2_Methodology_Report/NSCH_Design_and_Operations_052109.pdf. Accessed February 19, 2011
29. Child and Adolescent Health Measurement Initiative. *Measuring Medical Home for Children and Youth: Methods and Findings From the National Survey of Children With Special Health Care Needs and the National Survey of Children's Health*. Portland, OR. Data Resource Center for Child and Adolescent Health; 2009. Available at: http://ftp.cdc.gov/pub/health_statistics/nchs/slaits/nsch07/2_Methodology_Report/NSCH_Design_and_Operations_052109.pdf. Accessed February 19, 2011
30. Andersen RM. Revisiting the behavioral model and access to medical care: does it matter? *J Health Soc Behav*. 1995;36(1):1–10
31. Mulvihill BA, Altarac M, Swaminathan S, Kirby RS, Kulczycki A, Ellis DE. Does access to a medical home differ according to child and family characteristics, including special-health-care-needs status, among children in Alabama? *Pediatrics*. 2007;119(5 suppl 1):S107–S113
32. Toomey SL, Homer CJ, Finkelstein JA. Comparing medical homes for children with ADHD and asthma. *Acad Pediatr*. 2010;10(1):56–63
33. Singh GK, Strickland BB, Ghandour RM, van Dyck PC. Geographic disparities in access to the medical home among US CSHCN. *Pediatrics*. 2009;124(suppl 4):S352–S360
34. Patient Protection and Affordable Care Act (Pub L No. 111-148)
35. Szilagyi PG. Oral health in children: a pediatric health priority. *Acad Pediatr*. 2009;9(6): 372–373

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