

UCSF

UC San Francisco Previously Published Works

Title

Medical Home for Adolescents: Low Attainment Rates for Those With Mental Health Problems and Other Vulnerable Groups

Permalink

<https://escholarship.org/uc/item/9nr8759w>

Journal

Academic Pediatrics, 13(2)

ISSN

1876-2859

Authors

Adams, Sally H
Newacheck, Paul W
Park, M Jane
[et al.](#)

Publication Date

2013-03-01

DOI

10.1016/j.acap.2012.11.004

Peer reviewed

Medical Home for Adolescents: Low Attainment Rates for Those With Mental Health Problems and Other Vulnerable Groups

Sally H. Adams, RN, PhD; Paul W. Newacheck, DrPH; M. Jane Park, MPH; Claire D. Brindis, DrPH; Charles E. Irwin Jr., MD

Department of Pediatrics, University of California, San Francisco, Calif (Drs Adams, Newacheck, Brindis, and Irwin; and Ms Park); and Philip R. Lee Institute for Health Policy Studies, University of California, San Francisco, Calif (Drs Newacheck and Brindis)
Address correspondence to Sally H. Adams, RN, PhD, University of California, San Francisco, 3333 California St, Ste 245, San Francisco, CA 94143 (e-mail: adamss@peds.ucsf.edu).
Received for publication July 18, 2012; accepted November 20, 2012.

ABSTRACT

BACKGROUND: The importance of the medical home for children has been demonstrated but has not been examined comprehensively for adolescents. Adolescence is a unique period of physical, cognitive, and psychosocial changes when many mental disorders first emerge; thus, receiving care within a medical home could improve well-being. This study examines rates of medical home attainment and its components for adolescents and subgroups, including those with mental health conditions.

METHODS: Utilizing the 2007 National Survey of Children's Health, we determined the following for adolescents aged 10 to 17 years (n = 45 897): 1) rates of medical home attainment and its 5 components (usual source of care, having a personal doctor, and receiving needed referrals, effective care coordination, and family-centered care); and 2) subgroup differences; gender, race/ethnicity, income, insurance, region, language spoken at home, respondent education, and the presence of mental health conditions.

RESULTS: Fifty-four percent of adolescents had a past-year medical home. Rates were lower for minority youth compared

to whites; lower-income and uninsured youth; those in households that are non-English speaking in which the respondent did not have some college; and those with mental health as opposed to physical health conditions (all $P < .01$). Patterns of disparities in the medical home components were similar, and rates were lowest for effective care coordination and family-centered care components.

CONCLUSIONS: Nearly half of adolescents lacked a medical home in the past year. Even lower rates for subgroups highlight the need to increase access to comprehensive quality health care. Efforts to improve effective care coordination and family-centered care could result in higher quality of care for all children and adolescents, and specifically for disadvantaged adolescents and those with mental health conditions.

KEYWORDS: adolescent medical home; adolescent mental health disparities; mental health; underserved adolescents

ACADEMIC PEDIATRICS 2012; ■:1–9

WHAT'S NEW

Nearly half of adolescents lacked a past-year medical home. Significantly lower rates of having a medical home and its components were reported for adolescent minority, uninsured, low-income, non-English-speaking household groups, and those with mental health conditions.

THE IMPORTANCE OF the medical home has been established for children,^{1,2} adults,³ and children with special health care needs (CSHCN).^{4–7} The American Academy of Pediatrics (AAP) believes that all infants, children, and adolescents should receive their health care in a medical home—that is, an environment in which care is accessible, continuous, comprehensive, family-centered, coordinated, compassionate, and culturally effective.⁸ However, no studies have undertaken a comprehensive examination of medical homes for adolescents, who represent nearly half the pediatric population. Adolescence

is a unique period of transition that includes major physical, cognitive, and psychosocial changes.⁹ It is also a period when symptoms of many mental disorders first emerge.¹⁰ Addressing these circumstances presents special challenges to clinicians; however, health care organized and delivered within the medical home model has potential to improve adolescent health.

A recent review by Homer et al of the empirical literature on medical homes for children had promising results.¹¹ Although tempered by weak design, inconsistent definitions, and limited outcome measures, the authors reported that the preponderance of evidence from the 33 articles reviewed supported a positive relationship between medical home components and desired child and family outcomes, including better health status, timeliness of care, family-centeredness, and improved family functioning. Two recent studies using national samples found that children with medical homes had fewer emergency department visits for sickness¹² and fewer emergency department visits overall,¹³ indicating a beneficial influence on health care

utilization. However, none of these studies examined the medical home comprehensively. A 2011 study by Strickland et al examined multiple components of medical home attainment and disparities in a national sample of children aged 1 to 17 years and found lower rates of medical home attainment among adolescents compared to younger children.² This study also documented sizable disparities in medical home attainment among disadvantaged subgroups of children on the basis of race/ethnicity, income, insurance status, and other factors. However, this large study and most smaller studies of medical home status in pediatric populations have yielded few, if any, subgroup findings specific to adolescents. Because many health needs vary between younger children and adolescents and specific priorities for adolescent health care visits have been developed to address differences,^{14,15} it is important to determine health care quality for adolescents and vulnerable subgroups separately from the entire pediatric population. In a national analysis of CSHCN, Park et al found that fewer adolescents—or youth with special health care needs—had medical homes compared to younger CSHCN and that youth with special health care needs with mental health conditions were less likely to have a medical home than those without such conditions.¹⁶ In a study of CSHCN aged 3 to 17, Ghandour et al found that families of children with mental health problems experienced increased financial- and employment-related burdens if they did not have a medical home.¹⁷ Although these studies yielded useful findings, they provide neither a comprehensive analysis of medical home status of adolescents nationally nor a detailed assessment of disparities in medical home attainment within adolescent subgroups, including those with mental disorders.^{10,16–18}

A review of national population data concluded that approximately 20% of adolescents report symptoms of mental health problems,¹⁸ and lifetime prevalence of mental health conditions for adolescents is approximately 50%, with the highest prevalence due to anxiety, mood, and behavioral disorders.¹⁹ Mental health problems during adolescence are associated with lowered educational attainment,²⁰ increased risky sexual behavior and teen parenting,²¹ and greater substance use.²² Mental health disorders during adolescence can also have future negative consequences. Symptoms of half of lifetime cases of DSM-IV disorders occur by age 14, and a longitudinal analysis demonstrated that three-quarters of mental disorders during young adulthood were preceded by mental health disorders occurring during adolescence.^{10,23}

Diagnosis and treatment of mental health conditions during adolescence is crucial to healthy adolescent and adult development. Mental health care is generally provided in a separate system from primary care, often resulting in fragmented care with poor care coordination and many barriers.^{14,24} Federal and professional efforts to integrate mental health into primary care could lead to improved mental health for all children receiving care in a medical home model.^{14,24}

The purposes of this study were to provide national estimates from the 2007 National Survey of Children's Health

(NSCH) of the proportion of adolescents 10 to 17 years old who receive their care in medical homes and to examine disparities among disadvantaged adolescents and those with mental health problems. This information can help guide policy and practice related to improving quality of care and serve as a baseline for monitoring quality of care for adolescents.

METHODS

The present analyses utilized data from the 2007 NSCH, a nationally representative survey sponsored by the Maternal and Child Health Bureau.²⁵ The data were collected by the National Center for Health Statistics (NCHS) using the random-digit-dial State and Local Area Integrated Telephone Survey mechanism. This secondary analysis of publicly available data was exempt from institutional review board requirements. The original sample consisted of 91,642 parent or guardian respondents who completed an interview regarding their resident 1- to 17-year-old child's health and health care over the past year. The interview participation rate was 66% of identified households with children. This study utilized the subsample of 10- to 17-year-old adolescents ($n = 45,897$), an age group consistent with *Healthy People*, which defines adolescence as beginning at age 10.²⁶ The primary analyses examined: 1) past-year medical home and its subcomponent rates, whether these varied for younger (10 to 13 years old) versus older (14 to 17 years old) adolescents, and variation by selected predisposing, enabling and need variables²⁷; and 2) whether or not medical home status is related to adolescents' mental health status.

OUTCOME VARIABLES

Outcomes included medical home status and the 5 components of care used to operationalize the medical home construct in the NSCH: 1) had a usual source of care; 2) had a personal doctor or nurse; 3) received all needed referrals for specialty care; 4) received needed help in coordinating health and health care; and 5) received family-centered care. All measures assessed past-year status.²⁸ This binary medical home measure, developed for the NSCH, is a widely used reliable measure that closely reflects the aims of the medical home construct²⁹ addressing all AAP elements except for continuity and accessibility.³⁰ This standard measure was also used by Strickland et al in 2011, thus allowing for comparisons between adolescents and all children.² The individual components assessed on a binary basis to determine medical home status for each adolescent, varied according to the type and level of medical care needed. The [Appendix](#) presents sample sizes and scores for components and subcomponents.

All adolescents were assessed on whether or not they had a usual source of care (yes vs no) and a personal nurse or doctor (yes vs no). "Receipt of referrals as needed" (yes vs no) was queried only for parents who indicated that their adolescent had needed a referral for care. "Receipt of

effective care coordination” was assessed for the subgroup that had used more than 2 health care services. This component was measured by the adequacy of needed help the family received in coordinating care, their satisfaction with communication among doctors and other clinicians, and with communication between clinicians and other providers, such as those based in schools or other programs. “Receipt of family-centered care” was assessed among those who had at least 1 health care visit in the past year. An adolescent was considered to have received family-centered care if the parent reported that an interpreter was usually or always available when needed, and that physicians usually or always spent enough time, listened carefully, were sensitive to values and customs, and made the family feel like a partner.

PREDISPOSING, ENABLING, AND NEED VARIABLES

We were guided in the selection of the independent variables by Andersen’s Health Behavior Model, a widely used model including predisposing, enabling, and need characteristics involved in health care access and utilization.²⁷ Predisposing characteristics included gender, race/ethnicity, language spoken at home, and geographic region. Race/ethnicity included Hispanic, non-Hispanic white (referred to as white; referent category), non-Hispanic black (referred to as black), non-Hispanic multiracial, and other. Language spoken at home was English (referent category) versus any other language. Region included the Northeast (referent category), Midwest, Southeast, and West. Enabling characteristics included family income, health insurance status, and respondent education level. Family income was assessed using 3 levels of federal poverty level, as follows: lowest level, 0 to 199%; middle, 200 to 399%; and highest, 400% or more (referent category). Insurance status was scored as currently insured (referent category) versus not. Respondent education level was assessed with 3 categories: less than high school graduate; high school graduate (or equivalent); or more than high school graduate (referent category). Need characteristics included the presence of physical and mental health conditions, assessed through parental reports of whether a doctor or other clinician had ever told her or him that the adolescent ever had any of a set of conditions and, if yes, whether she or he currently had the condition. The 7 physical health problems included asthma; diabetes; seizures; hearing problems; vision problems not corrected by glasses or lenses; bone, joint, or muscle problems; and brain injury. Nine mental health problems included learning disability; attention deficit/hyperactivity disorder (ADHD/ADD); depression; anxiety; behavior or conduct problems; autism, Asperger syndrome or autism spectrum disorder; developmental delay; stuttering, stammering, or speech difficulty; and Tourette syndrome, all of which are included in the Diagnostic and Statistical Manual of Mental Disorders.³¹ Using these, we created a 4-item summary health condition variable: 1) physical health condition only (referent category); 2) mental health condition only; 3) both a physical and mental health condition; and 4) no conditions.

STATISTICAL ANALYSIS

All analyses were conducted using statistical weights provided by the NCHS to produce estimates reflecting national population totals. The weights were equal to the inverse of the sampling probability for each case, adjusted for nonresponse. The number of cases with missing data was small, excepting family income; to compensate, we used data files provided by NCHS²⁸ that included imputed values for missing income. Cases where responses were categorized as “not sure” (approximately 1% to 2%) were excluded.

Analyses included estimation of frequencies and standard errors for attainment of the medical home and its 5 components by the predisposing, enabling, and need variables described above (Table 1). We conducted multivariate logistic regression analyses to determine the independent contribution of these variables to explaining medical home status and components (Table 2); significance levels refer to multivariate results (bivariate results are available upon request). We computed frequencies to obtain the prevalences of the individual mental health and physical health conditions, individual medical home rates for each (Table 3), and logistic regressions to determine differences in medical home rates for each. Data were analyzed by SAS and SUDAAN software that took into account complex survey design.³²

RESULTS

MEDICAL HOME STATUS AND THE 5 MEDICAL HOME COMPONENTS

Fifty-four percent of adolescents had a medical home in the past year by meeting all relevant components of the medical home (Table 1). Overall attainment rates for the medical home components ranged from 64% for received family-centered care to 93% for having a usual source of care. The pattern of lowest rates for family-centered care and highest rates for usual source of care was generally consistent across the predisposing, enabling, and need variables. Rates for each of the components by predisposing, enabling, and need variables are presented in Table 1; Table 2 presents all multivariate results. Medical home status varied slightly between 10- to 13-year-olds (55.2%) and 14- to 17-year-olds (52.4%), $P < .05$. Among the 5 medical home components, only the referral component varied by age; parents of older adolescents were more likely to report that they had no problems getting referrals (84%) compared to those of younger adolescents (77%, $P < .01$).

PREDISPOSING VARIABLES

Medical home attainment and component rates varied significantly within 3 of the 4 predisposing variables: race/ethnicity, language spoken at home, and geographic region. Medical home rates for Hispanic (33%) and black (42%) adolescents were significantly lower than rates for white (64%) adolescents (both $P < .001$). This basic pattern of differences for minority youth held true for usual care source, personal doctor/nurse, coordinated care, and

Table 1. Past Year Rates (%) and Standard Errors (SE) of Having a Medical Home and Its Components by Selected Predisposing, Enabling, and Need Variables, 2007 National Survey of Children's Health

Characteristic	Had a Medical Home		Had a Usual Source of Care		Had a Personal Doctor or Nurse		Received Referrals When Needed		Received Effective Care Coordination		Received Family-Centered Care	
	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Total sample 10–17 years old (N = 45,897)	53.8	0.6	92.8	0.4	91.2	0.4	80.9	1.2	68.6	0.8	63.9	0.6
Gender												
Male	53.3	0.9	92.5	0.5	90.6	0.5	81.9	1.4	68.8	1.2	64.2	0.8
Female	54.3	0.9	93.2	0.5	91.7	0.5	79.7	1.9	68.5	1.2	63.7	0.9
Race/ethnicity												
NH-White	64.0	0.7	96.8	0.2	95.0	0.3	83.8	1.3	73.1	0.9	74.3	0.6
Hispanic	32.8	1.9	83.6	1.5	82.5	1.5	73.0	4.4	58.0	2.9	43.9	2.1
NH-Black	42.2	1.5	89.1	0.9	88.2	1.0	79.6	2.8	63.0	2.2	50.9	1.5
NH-Multiracial	56.4	1.7	93.4	1.4	90.8	1.6	73.7	4.7	67.5	3.5	69.3	2.6
Other	43.0	3.5	91.4	1.3	89.1	2.6	80.1	4.6	67.7	4.2	47.3	3.6
Language at home												
English	57.5	0.6	94.5	0.3	93.0	0.3	82.0	1.2	69.7	0.8	67.8	0.6
Other than English	22.1	2.2	79.2	1.9	76.3	2.1	62.3	6.2	59.5	3.8	29.0	2.5
Region												
Northeast	58.3	1.1	96.0	0.4	96.1	0.5	84.6	1.7	70.7	1.6	68.6	1.1
Midwest	58.9	0.8	94.2	0.5	92.1	0.5	82.8	1.7	70.6	1.1	68.3	0.8
South	53.0	1.0	92.6	0.5	90.4	0.6	79.7	1.8	67.9	1.3	62.8	0.9
West	46.9	1.8	89.4	1.2	87.9	1.2	77.7	3.6	66.2	2.5	57.9	1.9
Household FPL status												
<200% FPL	40.0	1.0	87.2	0.8	84.9	0.9	74.0	2.1	60.6	1.6	50.0	1.1
200–399% FPL	58.1	1.1	95.3	0.5	93.3	0.5	82.6	2.5	71.8	1.4	67.7	1.1
≥400% FPL	65.6	1.0	96.9	0.5	96.4	0.4	86.4	1.4	74.2	1.3	75.9	1.0
Health insurance												
Currently insured	56.5	0.7	95.7	0.3	93.5	0.4	81.9	1.2	70.0	0.9	66.3	0.7
Currently uninsured	27.9	1.7	75.6	2.0	69.5	1.9	66.2	5.2	49.1	3.3	38.9	2.2
Respondent education												
Less than high school diploma	31.4	1.9	80.2	1.9	81.9	1.6	66.5	5.7	62.9	3.4	43.1	2.3
High school diploma or GED	48.4	1.2	90.7	0.8	89.3	0.9	82.0	2.0	64.8	1.8	56.8	1.3
More than high school diploma or GED	61.0	0.7	96.3	0.3	93.9	0.4	82.5	1.4	71.1	0.9	71.2	0.7
Health conditions												
Physical condition only	55.5	1.8	94.2	1.1	94.9	0.6	78.6	3.3	70.6	2.1	67.4	1.8
Mental health condition only	46.0	1.5	93.7	0.9	91.1	1.2	74.5	2.8	55.1	2.0	58.2	1.7
Both physical and mental health conditions	35.0	2.6	89.8	2.2	94.1	1.1	76.1	3.5	50.2	3.1	55.5	2.8
No condition	56.7	0.8	92.7	0.4	90.5	0.5	84.7	1.6	76.0	1.0	65.3	0.8

NH = non-Hispanic; FPL = federal poverty level.

Table 2. Presence of a Past-Year Medical Home and Its Components by Selected Predisposing, Need, and Enabling Variables, Adolescents Aged 10 to 17, 2007 National Survey of Children's Health

Characteristic	Had a Medical Home	Had a Usual Source of Care	Had a Personal Doctor or Nurse	Received Referrals When Needed	Received Effective Care Coordination	Received Family-Centered Care
	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)
Gender						
Male †	1.0	1.0	1.0	1.0	1.0	1.0
Female	0.97 (0.87–1.07)	1.1 (0.87–1.39)	1.2 (0.95–1.5)	0.78 (0.59–1.1)	0.86 (0.73–1.0)	0.92 (0.82–1.0)
Race/ethnicity						
NH-White†	1.0	1.0	1.0	1.0	1.0	1.0
Hispanic	0.52 (0.42–0.66)***	0.42 (0.28–0.63)***	0.63 (0.42–0.94)*	0.88 (0.50–1.6)	0.58 (0.41–0.81)**	0.55 (0.43–0.70)***
NH-Black	0.49 (0.42–0.56)***	0.35 (0.27–0.46)***	0.53 (0.41–0.67)***	0.92 (0.62–1.4)	0.70 (0.57–0.88)**	0.44 (0.38–0.50)***
NH-Multiracial	0.84 (0.67–1.05)	0.54 (0.33–0.88)*	0.60 (0.35–0.94)*	0.69 (0.41–1.2)	0.90 (0.63–1.3)	0.88 (0.69–1.1)
Language at home						
English†	1.0	1.0	1.0	1.0	1.0	1.0
Other than English	0.50 (0.37–0.67)***	0.85 (0.53–1.34)	0.70 (0.47–1.1)	0.48 (0.26–0.90)*	0.98 (0.64–1.5)	0.42 (0.31–0.57)***
Region						
Northeast†	1.0	1.0	1.0	1.0	1.0	1.0
Midwest	0.99 (0.88–1.11)	0.64 (0.48–0.86)**	0.43 (0.32–0.58)***	0.89 (0.61–1.3)	0.96 (0.80–1.2)	0.94 (0.83–1.1)
South	0.97 (0.86–1.09)	0.75 (0.57–0.99)*	0.48 (0.36–0.65)***	0.83 (0.58–1.2)	0.94 (0.78–1.1)	0.92 (0.80–1.1)
West	0.77 (0.64–0.92)*	0.49 (0.35–0.70)***	0.36 (0.25–0.52)***	0.67 (0.40–1.1)	0.89 (0.68–1.2)	0.78 (0.64–0.95)*
Household FPL status						
≥400% FPL†	1.0	1.0	1.0	1.0	1.0	1.0
<200% FPL	0.66 (0.57–0.75)***	0.62 (0.38–1.01)	0.40 (0.30–0.53)***	0.53 (0.36–0.78)**	0.75 (0.61–0.93)**	0.60 (0.52–0.70)***
200–399% FPL	0.87 (0.76–0.99)*	0.93 (0.58–1.48)	0.64 (0.48–0.85)**	0.78 (0.50–1.2)	0.97 (0.80–1.2)	0.79 (0.68–0.92)**
Health insurance:						
Currently insured†	1.0	1.0	1.0	1.0	1.0	1.0
Currently uninsured	0.45 (0.38–0.5)***	0.30 (0.23–0.39)***	0.25 (0.20–0.32)***	0.57 (0.35–0.94)*	0.45 (0.34–0.59)***	0.52 (0.41–0.64)***
Respondent education						
More than high school diploma or GED†	1.0	1.0	1.0	1.0	1.0	1.0
Less than high school diploma	0.64 (0.52–0.77)***	0.38 (0.26–0.56)***	0.88 (0.66–1.2)	0.65 (0.37–1.2)	1.2 (0.88–1.7)	0.68 (0.55–0.85)***
High school diploma or GED	0.78 (0.70–0.88)***	0.53 (0.40–0.71)***	0.83 (0.66–1.1)	1.3 (0.88–1.8)	0.98 (0.81–1.2)	0.70 (0.61–0.80)***
Health conditions						
Physical condition only†	1.0	1.0	1.0	1.0	1.0	1.0
Mental health condition only	0.67 (0.55–0.80)***	1.0 (0.61–1.7)	0.62 (0.41–0.95)*	0.76 (0.48–1.2)	0.50 (0.39–0.65)***	0.64 (0.52–0.80)***
Both physical and mental health condition	0.44 (0.34–0.58)**	0.68 (0.38–1.2)	1.0 (0.61–1.8)	0.86 (0.51–1.4)	0.43 (0.31–0.59)***	0.64 (0.47–0.87)**
No condition	1.1 (0.97–1.3)	0.90 (0.58–1.4)	0.57 (0.42–0.77)***	1.5 (0.96–2.4)	1.4 (1.1–1.7)**	0.96 (0.81–1.1)

aOR = adjusted odds ratio; CI = confidence interval; NH = non-Hispanic; and FPL = federal poverty level.

* $P < .05$; ** $P < .01$; *** $P < .001$.

†Referent group. aORs control for gender (except gender analysis), race/ethnicity (except race/ethnicity analysis), language spoken at home (except language analysis), region (except region analysis), FPL (except FPL analysis), insurance status (except insurance analysis), respondent education (except respondent education analysis), health conditions (except health conditions analysis).

Table 3. Past-Year Prevalence of Selected Mental and Physical Health Conditions and Rates of Attaining a Medical Home for Adolescents Aged 10 to 17, 2007 National Survey of Children's Health

Health Condition	Prevalence, % (n)	Had Medical Home, %
Mental health conditions—Had at least 1 of the following:	18.5%	42.8%
Learning disability		
Yes	9.9% (4340)	41.2%**
No		55.2%
ADHD/ADD		
Yes	8.8% (4185)	45.7%**
No		54.7%
Depression		
Yes	3.1% (1479)	31.7%**
No		54.6%
Anxiety problems		
Yes	3.8% (2007)	32.7%**
No		54.7%
Behavior/Conduct problems		
Yes	4.1% (1623)	29.3%**
No		54.8%
Developmental delay		
Yes	3.3% (1342)	39.8%**
No		54.3%
Speech problem, stuttering, stammering		
Yes	2.4% (926)	36.8%**
No		54.2%
Autism, Asperger syndrome, autism spectrum		
Yes	1.1% (500)	36.4%*
No		54.0%
Tourette syndrome		
Yes	0.2% (132)	43.7%
No		53.9%
Physical health conditions—Had at least 1 of the following:	16.2% (7185)	48.2%
Vision problem not corrected by glasses or lenses		
Yes	1.7% (659)	36.3%**
No		54.1%
Bone, joint, muscle problem		
Yes	3.2% (1527)	38.0%**
No		54.3%
Asthma		
Yes	10.3% (4571)	50.9%
No		54.2%
Diabetes		
Yes	0.7% (271)	46.9%
No		53.9%
Seizures		
Yes	0.9% (317)	40.0%
No		53.9%
Hearing problem		
Yes	1.6% (733)	46.7%
No		53.9%
Brain injury		
Yes	0.6% (151)	36.2%
No		53.9%

* $P < .01$; ** $P < .001$.

family-centered care ($P < .05$ to $.001$). Multiracial adolescents were less likely to have a usual source of care and a personal doctor/nurse (both $P < .05$). Compared to adolescents from English-speaking households, those

from non-English-speaking households were less likely to have a medical home (22% vs 58%, $P < .001$), and less likely to receive family-centered care ($P < .001$) and referrals when necessary ($P < .05$). Compared to adolescents in the Northeast region, adolescents in the Western region were less likely to have a medical home and less likely to receive family-centered care (both $P < .05$). Compared to those in the Northeast region, adolescents in all other regions were less likely to have a usual source of care (Midwest, $P < .01$; South, $P < .05$; and West, $P < .001$) and a personal doctor/nurse (all $P < .001$).

ENABLING VARIABLES

Medical home rates varied by all 3 enabling variables. Rates for adolescents in the moderate-income (58%, $P < .05$) and lowest-income (40%, $P < .001$) groups were lower than those in the highest-income group (66%). With the exception of usual source of care, those in the lowest-income group were less likely to have obtained the remaining 4 components of care ($P < .01$ – 0.001). Those in the middle-income group were less likely to have a personal doctor/nurse and to receive family-centered care (both $P < .01$), compared to the highest-income group. Medical home rates for adolescents who were uninsured (28%) were substantially lower than rates for insured adolescents (57%) ($P < .001$). Uninsured adolescents were less likely than their insured counterparts to have obtained any of the 5 medical home components ($P < .05$ to $.001$). Medical home rates were significantly lower for adolescents whose parent-guardian had less than a high school diploma (31%) or had graduated from high school or the equivalent (48%) compared to those with more than a high school education (61%, both $P < .001$). Compared to those adolescents whose respondents had more than a high school diploma, those whose respondent had less education at any level were less likely to have a usual source of care and to receive family-centered care (all $P < .001$).

NEED VARIABLES

Seventy-one percent of the sample had none of the queried health conditions, 10.6% had a physical condition only, 12.8% had a mental health condition only, and 5.7% had both a physical and a mental health condition. Medical home attainment was significantly lower for those with a mental health condition only (46%) and those with both mental and physical conditions (35%), compared to those with a physical condition only (56%, both $P < .001$). Compared to those with a physical condition only, adolescents with a mental health condition only and those with no conditions were less likely to have a personal doctor/nurse ($P < .05$ and $P < .001$, respectively). Those with a mental health condition only or both mental and physical conditions were less likely to receive effective care coordination (both $P < .001$) and family-centered care ($P < .001$ and $P < .01$, respectively) compared to those with a physical condition only. Those with no conditions were more likely than those with a physical condition to receive coordinated care ($P < .01$).

INDIVIDUAL MENTAL AND PHYSICAL HEALTH CONDITIONS AND MEDICAL HOME STATUS

Nineteen percent of the sample had at least 1 mental health condition. Learning disabilities (10%) and ADHD/ADD (9%) were the most prevalent mental health conditions (Table 3). Prevalence of behavior/conduct problems and anxiety (both 4%), and depression and developmental delay (both 3%) were notable. Speech problems, autism and related conditions, and Tourette syndrome had prevalences of 2% or less. Medical home rates ranged from 29% for behavior and conduct problems to 46% for ADHD/ADD. For each mental health condition, fewer adolescents with the condition had medical homes than those without the condition. Except for Tourette syndrome, all differences were significant ($P < .01$ for autism, $P < .001$ for all others). Sixteen percent of adolescents had at least 1 of the queried physical health conditions (Table 3). Asthma (10%) was the most prevalent condition; prevalence of all other conditions—bone, joint or muscle problems, diabetes, seizures, hearing problems, vision problems not corrected by glasses or lenses, and brain injury—was 3% or less. There were no differences in medical home status between those with and without these conditions with 2 exceptions: those with bone, joint or muscle problems, and vision problems were less likely to have a medical home compared to those without these conditions, both $P < .01$.

DISCUSSION

Our study broadens the literature on access to quality care for the pediatric population by examining medical home status among U.S. adolescents. Barely a majority of adolescents received care in medical homes during 2007, with slightly higher rates among younger adolescents. Medical home attainment rates were significantly lower for subgroups including, black or Hispanic adolescents, adolescents from lower-income and less educated families, the uninsured, and families where no English is spoken at home. These findings are consistent with disparities in medical home attainment among all children.^{2,12,13} Our study also demonstrated significantly lower medical home rates among adolescents with mental health problems. This is particularly troubling, given the high onset of these problems during adolescence. Those with a mental health condition and a physical health problem fare even worse, with barely one-third receiving care in a medical home. The medical home model, if accessible to more adolescents, could facilitate early recognition of mental health problems and more timely interventions, including needed referrals, to reduce their severity and impact. Access to a medical home may also increase the proportion of adolescents who receive transitional services to adult care, as recommended by the AAP.^{33,34}

Findings on the 5 individual components provide greater specificity on how the health care system falls short of the medical home standard. These findings show major disparities among all subgroups: uninsured adolescents had a lower prevalence of all components; black and Hispanic

adolescents had lower prevalence of all components except receipt of referrals; adolescents from the lowest-income families had a lower prevalence of all components except usual source of care, indicating that even when able to access care, disadvantaged adolescents received poorer quality care. Adolescents outside the Northeast were less likely to have a usual source of care, a difference that may be attributable to the Northeast's higher population density or other factors not assessed in this study. Younger and older adolescents varied on only 1 of the 5 components—more problems getting referrals for the younger group—suggesting that overall, quality of care for adolescents was consistent, regardless of age. Adolescents with mental health conditions, and especially those with physical comorbidities, were less likely to receive family-centered care and coordinated care, and to have a personal doctor or nurse.

This study suggests that family-centered care is particularly difficult to access. This component had the lowest prevalence of attainment; significant disparities in this component were identified within each group of predisposing, enabling and need variables, except for gender. Our findings also tentatively suggest that receiving coordinated care is a greater challenge than receiving referrals. This pattern also replicates the findings for all children by Strickland et al.² This held true among adolescents with mental health problems—a surprising finding, given the well-documented paucity of mental health providers skilled in serving adolescents. However, the referral measure in NSCH does not provide detail on referral type (eg, for a physical vs mental health problem). Therefore, this finding bears further examination.

Many factors impede adolescents' access to the quality care represented in the medical home concept. In a landmark 2008 report, the Institute of Medicine documents a poorly coordinated and fragmented service delivery system and a shortage of clinicians trained to serve adolescents, especially for those with mental health conditions.¹⁴ The Institute of Medicine report cites a marked shortage of mental health providers skilled in serving adolescents and limited implementation of effective care in community-based settings.^{14(p158)} Furthermore, insurance plans frequently limit the number of annual mental health visits that are covered and some plans impose high copays.¹⁴ "Carve-out" arrangements, where mental health services are delivered separately from the physical health care system, can pose barriers. The use of carve-outs has increased since the early 1990s in both private and public insurance.³⁵ These arrangements can discourage coordinated care and referrals among clinicians and often preclude reimbursement to primary care clinicians for services related to mental health conditions.^{14,35}

Many initiatives to improve children's access to mental health services have been implemented, including efforts to integrate mental health care into primary care settings.²⁴ These initiatives have adopted diverse strategies, such as telemedicine and colocating mental health and primary care providers, who may be employed by different systems. The 2010 Patient Protection and Affordable Care Act

(ACA) supports programs to facilitate integration of mental health and physical health services.^{36,37} Other national programs may help address barriers to mental health care, as well as other disparities identified in this study. Building on the ACA, federal efforts to reduce racial and ethnic disparities³⁸ aim to transform the health care system through strategies including increasing the proportion of the population who have a usual primary care provider and patient-centered health homes, and increasing the diversity of the workforce. These developments hold promise for increasing attainment of several components of the medical home.

Currently, measurement of medical home status for pediatric populations does not distinguish between younger children and adolescent patients. Refinement of measurement for adolescents to reflect the developmental stage of transitioning to young adulthood could provide a more sensitive evaluation of meeting the needs of the adolescent population. The inclusion of 2 elements of adolescent care identified in Bright Futures,¹⁵ the provision of time alone with a provider³⁹ and the receipt of transitional services to adult care for older adolescents would provide a more thorough evaluation of the quality of care for adolescents.

LIMITATIONS

Our results provide a snapshot of past-year medical home status, reflecting adolescents' health status and needs within that time frame. As health status and attendant care needs shift, medical home status could change. Thus, the health care system's ability to provide a medical home may vary across time. A longitudinal survey would be needed to capture this dynamic process. The medical home, its 5 component outcomes, and the health conditions were measured through parental report. Given that the patient/parent experience is an important tenet of the patient-centered medical home model for pediatric populations, parent reports are an important information source. However, if adolescents access confidential care or care in school-based clinics, parents may not be fully aware of all aspects of the adolescent's care and could have different views on its quality than their adolescents might have. However, we are unaware of any systematic bias in parental reports regarding health status and services; a recent study has demonstrated moderate to substantial correspondence between clinician and parent report of adolescent mental health problems.⁴⁰ The 5 components used to operationalize medical home in this analysis approximate the AAP definition but are not exact; for example, continuity and accessibility are not included. Because of the NSCH's cross sectional design, causal inferences cannot be made regarding associations. Finally, the sample may underrepresent vulnerable subgroups of adolescents: those whose families are unable to participate in a telephone interview, those without landline telephones, or who are runaways, in group homes, or in correctional facilities. The data are weighted to address group underrepresentation to the extent possible.

CONCLUSIONS

This study provides national baseline estimates of the proportion of adolescents receiving care in medical homes and can be used with future editions of the NSCH to benchmark progress. Future editions of the survey, including the 2011 NSCH with a planned release in 2013, will allow measurement of progress in expanding medical homes for all adolescents and vulnerable subgroups. Our results document significant shortcomings in adolescents' receipt of care within a medical home, especially for the disadvantaged and those with mental health conditions. Initiatives to improve access to medical homes have been developed and warrant further support. Provisions in the ACA hold promise for supporting these initiatives. Realizing this promise will require advocacy to ensure that resources are targeted to address adolescents' unique needs through increased access to the quality represented by the medical home.

ACKNOWLEDGMENTS

This research was supported by grants from the Maternal and Child Health Bureau, Health Resources and Services Administration, U.S. Department of Health and Human Services (U45MC 00002 and U45MC 00023).

We thank the reviewers for their excellent review comments.

SUPPLEMENTARY DATA

Supplementary data related to this article can be found online at <http://dx.doi.org/10.1016/j.acap.2012.11.004>.

REFERENCES

1. Sia C, Tonniges TF, Osterhus E, et al. History of the medical home concept. *Pediatrics*. 2004;113(5 suppl):1473–1478.
2. Strickland BB, Jones JR, Ghandour RM, et al. The medical home: health care access and impact for children and youth in the US. *Pediatrics*. 2011;127:604–611.
3. American College of Physicians. Patient-centered medical home. Available at: http://www.acponline.org/running_practice/pcmh/. Accessed November 13, 2012.
4. Cooley WC, McAllister JW, Sherrieb K, et al. Improved outcomes associated with medical home implementation in pediatric primary care. *Pediatrics*. 2009;124:358–364.
5. Strickland B, McPherson M, Weissman G, et al. Access to the medical home: results of the National Survey of Children with Special Health Care Needs. *Pediatrics*. 2004;113(suppl):1485–1492.
6. 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;32:188–196.
7. 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;156:1006–1010.
8. American Academy of Pediatrics. The medical home. *Pediatrics*. 2002;110(1 pt 1):184–186.
9. Mulye TP, Park MJ, Nelson CD, et al. Trends in adolescent and young adult health in the United States. *J Adolesc Health*. 2009;45:8–24.
10. Kessler RC, Berglund P, Demler O, et al. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey replication. *Arch Gen Psychiatry*. 2005;62:593–602.
11. 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:e922–e937.

12. Long WE, Bauchner H, Sege RD, et al. The value of the medical home for children without special health care needs. *Pediatrics*. 2012;129:87–98.
13. Romaine MA, Bell JF, Grossman DC. Health care use and expenditures associated with access to the medical home for children and youth. *Med Care*. 2012;50:262–269.
14. National Resource Council/Institute of Medicine. *Adolescent Health Services: Missing Opportunities*. Washington, DC: National Academies Press; 2008.
15. Hagan JF, Shaw JS, Duncan PM, eds. *Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents*. 3rd ed. Elk Grove Village, Ill: American Academy of Pediatrics; 2008. Available at: http://brightfutures.aap.org/pdfs/Guidelines_PDF/18-Adolescence.pdf. Accessed November 13, 2012.
16. Park MJ, Adams SH, Irwin CE Jr. Health care services and the transition to young adulthood: challenges and opportunities. *Acad Pediatr*. 2011;11:115–122.
17. Ghandour RM, Perry DF, Kogan MD, et al. The medical home as a mediator of the relation between mental health symptoms and family burden among children with special health care needs. *Acad Pediatr*. 2011;11:161–169.
18. Knopf DK, Park MJ, Paul Mulye T. *The Mental Health of Adolescents: A National Profile, 2008*. San Francisco, Calif: National Adolescent Health Information Center, University of California, San Francisco; 2008. Available at: <http://nahic.ucsf.edu/download/the-mental-health-of-adolescents-a-national-profile>. Accessed November 13, 2012.
19. Merikangas KR, He JP, Burstein M, et al. Lifetime prevalence of mental disorders in US adolescents: results from the National Comorbidity Survey Replication—Adolescent Supplement (NCS-A). *J Am Acad Child Adolesc Psychiatry*. 2010;49:980–989.
20. Kessler RC, Foster CL, Saunders WB, et al. Social consequences of psychiatric disorders 1: educational attainment. *Am J Psychiatry*. 1995;152:1026–1032.
21. Kessler RC, Berglund PA, Foster CL, et al. Social consequences of psychiatric disorders, 2: teenage parenthood. *Am J Psychiatry*. 1997;154:1405–1411.
22. Glied S, Pine DS. Consequences and correlates of adolescent depression. *Arch Pediatr Adolesc Med*. 2002;156:1009–1014.
23. Kim-Cohen J, Caspi A, Moffitt T, et al. Prior juvenile diagnoses in adults with mental disorder: developmental follow-back of a prospective-longitudinal cohort. *Arch Gen Psychiatry*. 2003;60:709–717.
24. National Institute for Health Care Management Research and Educational Foundation. *Strategies to Support the Integration of Mental Health Into Pediatric Primary Care*. Washington, DC: National Institute for Health Care Management Research and Educational Foundation; 2009. Available at: <http://nihcm.org/pdf/PediatricMH-FINAL.pdf>. Accessed November 13, 2012.
25. Blumberg SJ, Foster EB, Frasier AM, et al. Design and operation of the National Survey of Children's Health, 2007. Vital Health Statistics. 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 November 13, 2012.
26. US Department of Health and Human Services. Healthy People 2020. Available at: <http://healthypeople.gov/2020/topicsobjectives2020/overview.aspx?topicid=2>. Accessed November 13, 2012.
27. Andersen RM. Revisiting the behavioral model and access to medical care: does it matter? *J Health Soc Behav*. 1995;36:1–10.
28. 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, Ore: Data Resource Center for Child and Adolescent Health; 2009. Available at: http://www.childhealthdata.org/docs/medical-home/mhmanual_withappendices-updated-12-7-10-pdf. Accessed November 13, 2012.
29. Sternberg SB, Co JPT, Homer CJ. Review of quality measures of the most integrated health care settings for children and the need for improved measures: recommendations for initial core measurement set for CHIPRA. *Acad Pediatr*. 2011;11:S49–S58.e3.22.
30. Child and Adolescent Health Measurement Initiative, Oregon Health and Science University. *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—A Resource Manual for Child Health Program Leaders, Researchers and Analysts: Methodology for Medical Home in the 2007 NSCH*. Available at: http://childhealthdata.org/docs/medical-home/mh_manual_methodology-pdf.pdf. Accessed November 13, 2012.
31. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. 4th ed. Washington, DC: American Psychiatric Association; 2000.
32. Shah BV, Barnwell BG, Bieler GS. *SUDAAN User's Manual, Release 7.0*. Research Triangle Park, NC: Research Triangle Institute; 1996.
33. Lotstein DS, Kuo AA, Strickland B, Tait F. The transition to adult health care for youth with special health care needs: do racial and ethnic disparities exist? *Pediatrics*. 2010;126(suppl 3):S129–S136.
34. American Academy of Pediatrics, American Academy of Family Physicians, and American College of Physicians, Transitions Clinical Report Authoring Group. Clinical report supporting the health care transition from adolescence to adulthood in the medical home. *Pediatrics*. 2011;128:182–200.
35. Frank RG, Garfield RL. Managed behavioral health care carve-outs: past performance and future prospects. *Annu Rev Public Health*. 2007;28:303–320.
36. National Council for Community Behavioral Health Care. Summary of the major provisions in the Patient Protection and Affordable Health Care Act. April 2010. Available at: <http://www.thenationalcouncil.org/galleries/policy-file/HC%20Reform%20Bill%20Update-April%207.pdf>. Accessed November 13, 2012.
37. English A. *The Patient Protection and Affordable Care Act of 2010: How Does It Help Adolescents and Young Adults?* Chapel Hill, NC: Center for Adolescent Health and the Law; and San Francisco, Calif: National Adolescent Health Information and Innovation Center, 2010. Available at: <http://nahic.ucsf.edu/download/the-patient-protection-and-affordable-care-act-how-does-it-help-adolescents-and-young-adults>. Accessed November 13, 2012.
38. US Department of Health and Human Services (HHS). *HHS Action Plan to Reduce Racial and Ethnic Disparities: A Nation Free of Disparities in Health and Health Care*. Washington, DC: US Department of Health and Human Services, April 2011. Available at: http://minorityhealth.hhs.gov/npa/files/Plans/HHS/HHS_Plan_complete.pdf. Accessed November 13, 2012.
39. Irwin CE Jr, Adams SH, Park MJ, et al. Preventive care for adolescents: few get visits and fewer get services. *Pediatrics*. 2009;123:e565–e572.
40. Hanssen-Bauer K, Langsrud Ø, Kvernmo S, et al. Clinician-rated mental health in outpatient child and adolescent mental health services: associations with parent, teacher and adolescent ratings. *Child Adolesc Psychiatry Mental Health*. 2010;4:29. Available at: <http://www.capmh.com/content/4/1/29>. Accessed November 13, 2012.