

Unmet Health Care Need in US Adolescents and Adult Health Outcomes

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abstract

BACKGROUND: Adolescence is a formative period when health care services have a unique opportunity to influence later health outcomes. Unmet health care need in adolescence is known to be associated with poor contemporaneous health outcomes; it is unknown whether it predicts poor adult health outcomes.

METHODS: We used nationally representative data from 14 800 subjects who participated in Wave I (mean age: 15.9 years [1994/1995]) and Wave IV (mean age: 29.6 years [2008]) of the National Longitudinal Study of Adolescent to Adult Health. Logistic regression models were used to estimate the association between unmet health care need in adolescence and 5 self-reported measures of adult health (fair/poor general health, functional impairment, time off work/school, depressive symptoms, and suicidal ideation). Models were adjusted for baseline health, insurance category, age, gender, race/ethnicity, household income, and parental education.

RESULTS: Unmet health care need was reported by 19.2% of adolescents and predicted worse adult health: fair/poor general health (adjusted odds ratio [aOR]: 1.27 [95% confidence interval (CI): 1.00–1.60]); functional impairment (aOR: 1.52 [95% CI: 1.23–1.87]); depressive symptoms (aOR: 1.36 [95% CI: 1.13–1.64]); and suicidal ideation (aOR: 1.30 [95% CI: 1.03–1.68]). There was no significant association between unmet health care need and time off work/school (aOR: 1.13 [95% CI: 0.93–1.36]). Cost barriers accounted for only 14.8% of unmet health care need. The reason for unmet need was not significantly related to the likelihood of poor adult health outcomes.

CONCLUSIONS: Reported unmet health care need in adolescence is common and is an independent predictor of poor adult health. Strategies to reduce unmet adolescent need should address health engagement and care quality, as well as cost barriers to accessing services.



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WHAT'S KNOWN ON THIS SUBJECT: Unmet health care need in adolescence is associated with poor contemporaneous health outcomes. Adolescence is increasingly recognized as an important stage of the life-course, when there may be a significant opportunity for health care interventions to improve later health outcomes.

WHAT THIS STUDY ADDS: The odds of adverse adult health outcomes were 13% to 52% higher among subjects who had reported unmet health care need in adolescence, compared with subjects with similar adolescent health outcomes, insurance coverage, and sociodemographic background but no unmet need.

Adolescence has been described as the foundation of future health, a formative period when lifelong health attitudes and behaviors are established and when health care services may have an important opportunity to influence future health outcomes.^{1,2} Both in the United States and globally, many adolescents do not access the health care services they need, and this opportunity is lost.^{2,3} In many countries, cost is a significant barrier to health care access, and the World Health Organization has identified universal health coverage for adolescents as a global health priority.⁴ However, even when adolescents have access to services, many forgo health care for other reasons, including concerns about confidentiality, stigma, and judgmental attitudes among health care providers.^{2,5,6}

Unmet health care need (or forgone health care) in adolescence is known to be associated with poor contemporaneous health outcomes,⁷ particularly among those who forgo care due to concerns about confidentiality.⁸ Country-level data also show an association between provision of high-quality, accessible health services for adolescents and better adult health⁹; based on these data, the World Bank, UNICEF, and others have argued that delivering such services is an important investment in a country's future population health.^{3,9} However, this link has not previously been investigated with the use of prospective, individual-level data.

To investigate the association between adolescent unmet health care need and adult health outcomes, data from Waves I and IV of the US National Longitudinal Study of Adolescent to Adult Health (Add Health) were used. Unmet health care need was distinguished from a wide range of childhood/adolescent factors that are known to influence adult health outcomes, including previous health status, health care insurance,

and a range of sociodemographic variables.^{10,11} We hypothesized that after adjusting for these factors, the odds of adverse adult health outcomes would be higher among subjects who had reported unmet health care need in adolescence, compared with those with no unmet need. We also examined whether the reason for unmet need in adolescence was associated with having poor adult health outcomes.

METHODS

Participants

Data from Waves I and IV of the Add Health study were accessed. At Wave I (1994/1995), a total of 18 924 participants were included in the nationally representative sample. Two surveys were administered for each participant: 1 was completed by the adolescents and 1 by their parent/caregiver. At Wave IV (2008), 97.6% of the original sample ($n = 18\,467$) were eligible to participate, with 78.2% ($n = 14\,800$) interviewed at Wave IV; Supplemental Table 5 presents the full details.

Nonresponders at Wave IV were more likely to be male, nonwhite, and of lower socioeconomic status; Wave IV weights, developed to address this differential nonresponse, were used. Previous analyses using these weights have shown negligible nonresponse bias for most health outcomes, with the exception of a few outcomes with very low prevalence.¹² Full details of the survey design and protocol, as well as data on demographic characteristics and health outcomes in Wave I, have been published previously.^{7,13}

Variables

Primary Dependent Variables

Five self-reported health outcomes that do not rely on diagnosis by a health care professional were selected. The outcomes were: self-reported general health (dichotomized as fair/poor vs.

excellent/very good/good); functional impairment (eg, difficulty in bowling, playing golf) (little/lot of difficulty vs. no difficulty); missed any work/school in the last month for health reasons (every day/almost every day/a few times vs. never); depressive symptoms, assessed by the 10-item Center for Epidemiologic Studies Depression Scale (CES-D Scale),¹⁴ (each item was scored from 0 (never/rarely) to 3 (most/all of the time), the sum of all responses was dichotomized as score $\geq 10/30$); suicidal ideation within the last year (yes vs. no).

Independent Variables

The main independent variable was unmet health care need in Wave I, assessed by using the question "Has there been any time over the past year when you thought you should get medical care, but you did not? (yes versus no)." Participants who responded "yes" to the question were asked to indicate ≥ 1 reason. Previous analyses of this data set have distinguished between access and nonaccess reasons.⁷ Subsequently, there has been extensive policy interest in the impact of cost barriers and provision of confidentiality on adolescent health care use.^{2,8,15} We therefore divided responses into 4 categories of unmet health care need: access issues due to cost; access issues for nonfinancial factors; perceived negative consequences of accessing care; and perceived low importance of the problem. Respondents could be included in >1 category (the Supplemental Methods presents details of responses included in each category). Wave I prevalence and associations of the reasons given for not accessing care have been published previously.^{7,8}

Covariates

All covariates were taken from Wave I responses. Sociodemographic covariates were as follows: age (year of birth); gender; race/ethnicity

(Hispanic, non-Hispanic white, non-Hispanic black, mixed/other); household income (deciles); and parental education (9 categories ranging from less than eight grade to postgraduate training/study). The parent interview was completed by the mother/female caregiver in 93.5% of cases. Insurance categories were defined as Medicare/Medicaid, private, prepaid health plan (eg, health maintenance organization), other, and none. To control for adolescent health status (Wave I), we used the same 5 measures used in the dependent variables (Wave IV). Wave I outcomes were defined and recorded in the same way as in Wave IV, with the exception of functional impairment, which was defined as “any difficulty in walking one-quarter of a mile (yes versus no)” in Wave I and as “any difficulty in moderate activities (eg, playing golf or bowling)” in Wave IV.

Analysis

Three main sets of analyses were performed. First, the prevalence of unmet health care need in Wave I and health outcomes in Wave IV were calculated according to age, gender, race/ethnicity, household income, insurance, and education categories. Second, logistic regression models were used to estimate the odds ratios of poor adult health outcomes associated with any unmet health care need in adolescence. The first model was unadjusted; in the second model, we controlled for adolescent health status and sociodemographic factors (age, gender, race/ethnicity, parental education, household income, and insurance category). All covariates were treated as categorical. Interactions between age, gender, and race/ethnicity were tested for each model and included where significant ($P < .05$). Third, the adjusted models were repeated for each category of unmet health care need (cost, nonfinancial access barriers, negative consequences of accessing care, and low importance)

versus all other categories (ie, at least 1 versus none of the reasons included in that category).

In addition, 2 sets of sensitivity analyses were conducted. First, we investigated whether the regression findings were robust to imputation of missing data. Second, we assessed the robustness of the regression findings to use of a different analytical technique. Double robust estimators were calculated, which included 2 models: 1 for estimating the propensity score to account for selection into the key independent variable and 1 for the outcome. Thus, the likelihood of bias due to model misspecification was reduced.¹⁶ Full details of these sensitivity analyses are presented in the Supplemental Methods.

Consistent with the sampling strategy used in Add Health, all the main analyses were weighted and accounted for strata and clustering. All analyses were performed by using Stata version 12 (Stata Corp, College Station, TX). This research was approved by the Boston Children’s Hospital institutional review board.

RESULTS

Summary of Survey Responses

Table 1 presents participants’ sociodemographic details and the prevalence of unmet health care need in each group. In summary, 46.8% of participants were male, and the mean \pm SD age was 15.9 ± 1.8 years in Wave I. The majority were non-Hispanic white (53.3%), with 20.2% non-Hispanic black, 15.9% Hispanic, and 10.7% other/mixed race. Private insurance (eg, Blue Cross/Cigna) was reported by 50.8%, prepaid (eg, health maintenance organization/Civilian Health and Medical Program of the Uniformed Services) by 23.3%, Medicare/Medicaid by 9.6%, other by 4.1%, and none by 12.3%. Mean household income in Wave I was \$47 610, and 83.1% of parents had completed high school. The weighted

prevalence of unmet health care need was 19.2% in Wave I, with a range of 14.3% to 24.6% across sociodemographic and insurance groups. Regarding the 5 health outcomes in Wave I, fair/poor general health was reported by 6.9%, functional impairment by 0.5%, missed school by 34.3%, depressive symptoms by 23.6%, and suicidal ideation by 13.6%.

In weighted Wave IV analyses, the mean age was 29.6 ± 1.8 years. The prevalence of adverse health outcomes in Wave IV among those who did and did not report unmet need in Wave I is presented in Table 2. The prevalence of adverse Wave IV health outcomes in each sociodemographic group is presented in Supplemental Table 6.

Association Between Wave I Unmet Health Care Need and Wave IV Health Outcomes

The principal regression models are presented in Table 3. The unadjusted model exhibited a statistically significant positive association between unmet health care need in Wave I and poorer health on all 5 outcomes in Wave IV ($P \leq .001$). With the exception of time off work/study, these associations remained significant ($P < .05$) when adjusting for adolescent health, sociodemographic variables, and insurance status.

The most common reason for unmet need was perceived low importance (37.2%), followed by nonfinancial access problems (32.0%), negative consequences of health care (22.7%), and cost (14.8%) (data not shown). No significant differences in health outcomes were seen between the different categories of unmet need. Associations between each category of unmet need and Wave IV outcomes are presented in Table 4.

For each measure, the Wave I response was the strongest predictor of Wave IV response (all $P < .001$). For example, the adjusted odds ratio

TABLE 1 Sample Description and Prevalence of Unmet Health Care Need, Wave I of the Add Health Study, 1994/1995

Characteristic	N	%	Prevalence of Unmet Health Care Need (%)
Total	14 800	100.0	19.2
Gender			
Male	6932	46.8	18.3
Female	7866	53.2	20.1
Total	14 798	100.0	
Year of birth			
1974–1977	3694	25.0	24.6
1978–1979	5753	38.9	21.2
1980–1984	5343	36.1	14.3
Total	14 790	100.0	
Race/ethnicity			
Hispanic	2343	15.9	20.7
Non-Hispanic white	7877	53.3	17.6
Non-Hispanic black	2978	20.2	23.1
Other/mixed	1575	10.7	22.5
Total	14 773	100.0	
Wave I insurance			
Medicaid/Medicare	1183	9.6	17.2
Individual/group (eg, Blue Cross, Cigna)	6293	50.8	17.0
Prepaid (eg, HMO/CHAMPUS)	2883	23.3	18.3
Other	505	4.1	21.3
None	1528	12.3	24.1
Total	12 392	100.0	
Wave I household income, \$			
Low (<20 000 per year)	2285	20.4	21.5
Medium (20 000–49 000 per year)	4712	42.0	17.9
High (≥50 000 per year)	4218	37.6	16.9
Total	11 215	100.0	
Parental education			
Did not graduate high school	2148	16.9	20.4
High school diploma or equivalent	3739	29.5	19.4
Some college/university	3749	29.6	16.9
Graduated college/university	3053	24.1	17.0
Total	12 689	100.0	

CHAMPUS, Civilian Health and Medical Program of the Uniformed Services; HMO, health maintenance organization; N, number of observations in each category (unweighted).

(aOR) of fair/poor self-reported health in Wave IV following fair/poor self-reported health in Wave I was 3.17 (95% confidence interval [CI]: 2.40–4.20). The corresponding aORs for the other measures were: functional limitation, 6.24 (95% CI: 3.11–12.49); missed work/school, 1.45 (95% CI: 1.24–1.69); depressive symptoms, 2.51 (95% CI: 2.17–2.90);

and suicidal ideation, 3.21 (95% CI: 2.54–4.06) (data not shown).

Sensitivity Analyses

The aORs of poor adult health outcomes did not differ significantly between the main regression models and models that used multiply imputed data (Supplemental Tables 7–11). Due to smaller SEs, the

statistical significance of most associations was greater in the imputed analyses.

The double robust estimates mirrored the regression model findings of a significant association between unmet health care need in Wave I and functional impairment, depressive symptoms, and suicidal ideation in Wave IV (all $P < .001$) (Supplemental Table 12). The significance of the association with time off work was greater in the double robust models versus the main regression models ($P = .003$ vs $.220$), whereas the association with fair/poor general health was slightly weaker ($P = .056$ vs $.046$).

DISCUSSION

Adolescent health outcomes, which are known to be associated with contemporaneous unmet health care need, were the strongest predictors of adult health outcomes in this study. However, the odds of adverse adult health outcomes were 13% to 52% higher among subjects who had reported unmet health care needs in adolescence, compared with subjects with similar adolescent health outcomes, insurance coverage, and sociodemographic background but no unmet need. The same pattern was seen regardless of the reason for unmet need. Although some unmet need was due to inability to pay, the majority was due to nonfinancial or nonaccess reasons; unmet health care need was prevalent in all sociodemographic groups and in all categories of insurance coverage.

One explanation for these findings is that unmet health care need in adolescence causes poor health in adulthood. Another possibility is that unmet health care need reflects low health literacy/health engagement or other vulnerabilities, which tend to be fairly established by adolescence and which lead to poorer adult health outcomes in other ways, such as through riskier behaviors.^{1,17} Both

TABLE 2 Prevalence of Adverse Health Outcomes in Wave IV According to Unmet Health Care Need in Wave I

Outcome	No Unmet Need	Any Unmet Need	P
Fair/poor general health	8.7%	11.9%	<.001
Functional impairment	8.5%	12.0%	<.001
Missed school/work	17.4%	21.3%	<.001
Depressive symptoms	19.3%	28.1%	<.001
Suicidal ideation	6.6%	9.7%	<.001

TABLE 3 aORs of Wave IV Health Outcomes: Unmet Health Care Need in Wave I Versus no Unmet Need

Outcome	aOR	95% CI	P
Unadjusted model			
Fair/poor general health	1.42	1.17–1.72	<.001
Functional impairment	1.46	1.23–1.75	<.001
Time off work	1.29	1.11–1.49	.001
Depressive symptoms	1.63	1.41–1.89	<.001
Suicidal ideation	1.53	1.22–1.93	<.001
Adjusted model ^a			
Fair/poor general health	1.27	1.00–1.60	.046
Functional impairment	1.52	1.23–1.87	<.001
Time off work	1.13	0.93–1.36	.220
Depressive symptoms	1.36	1.13–1.64	.001
Suicidal ideation	1.32	1.03–1.68	.026

Baseline (Wave I) health status was defined and recorded in the same way as in Wave IV, with the exception of functional impairment, which was defined as “any difficulty in walking one-quarter of a mile (yes versus no)” in Wave I and “any difficulty in moderate activities (eg, playing golf or bowling)” in Wave IV. The Methods section presents the definitions of all Wave IV health outcomes. Interaction terms between age, gender, and race/ethnicity were assessed and included where significant ($P < .05$): age*race/ethnicity for fair/poor general health, gender*age for depressive symptoms, and gender*race/ethnicity for suicidal ideation.

^a Adjusted for gender, age (year of birth), race/ethnicity, parental education, Wave I insurance category, Wave I household income, and corresponding Wave I health outcome. All were treated as categorical variables. The Supplemental Methods present details of all covariates.

possibilities are plausible. Unmet health care need in adolescence may cause poor adult health directly, through missed opportunities for

effective treatment and preventive care; for example, there is good evidence that convenient, regular access to an empathetic,

TABLE 4 aORs of Wave IV Health Outcomes: Single Category of Unmet Health Care Need in Wave I Versus All Other Categories

Outcome	aOR	95% CI	P
Cost versus all other reasons for unmet need			
Fair/poor general health	1.43	0.88–2.31	.14
Functional impairment	1.05	0.63–1.73	.86
Time off work	1.02	0.69–1.51	.91
Depressed	0.95	0.62–1.45	.80
Suicidal ideation	1.08	0.61–1.93	.79
Nonfinancial access factors versus all other reasons for unmet need			
Fair/poor general health	0.91	0.60–1.37	.64
Functional impairment	1.03	0.69–1.56	.87
Time off work	0.90	0.64–1.26	.54
Depressed	1.05	0.75–1.46	.77
Suicidal ideation	0.88	0.54–1.41	.58
Perceived negative consequences of accessing care versus all other reasons for unmet need			
Fair/poor general health	1.38	0.88–2.18	.16
Functional impairment	1.45	0.94–2.23	.09
Time off work	1.07	0.79–1.44	.65
Depressed	1.30	0.96–1.76	.09
Suicidal ideation	1.40	0.95–2.06	.09
Low importance/urgency of health problem versus all other reasons for unmet need			
Fair/poor general health	0.82	0.58–1.18	.29
Functional impairment	0.98	0.65–1.49	.92
Time off work	1.03	0.73–1.46	.87
Depressed	0.90	0.64–1.25	.52
Suicidal ideation	0.82	0.55–1.24	.34

A total of 3058 participants reported unmet health care need in Wave I. They were then asked to indicate all the reasons for unmet need that applied. Four categories were derived from 10 options describing why care was not received. These categories were as follows: cost (could not pay); nonfinancial access factors (did not know who to see, no transportation, no one to go along with, parent would not go, hard to make appointment, other); negative consequences (did not want parents to know, afraid of what doctor will say or do); and low importance/urgency (thought problem will go away). Covariates, interaction terms, and all other details of the regression models were the same as in Table 2.

nonjudgmental health care provider improves adherence to medication plans (and thus to long-term outcomes) for adolescents with diabetes, cystic fibrosis, or organ transplants.¹⁸ There may also be indirect effects on adult health. Adolescence is recognized as a formative period for establishing attitudes toward health and patterns of health care-seeking behavior^{1,2}; thus, unmet need in this age group may lead to greater adoption of unhealthy behaviors or lower likelihood of accessing care in the future. However, health outcomes are known to be influenced by a wide range of individual, family, peer, and societal factors, as well as health care,¹⁷ and adult behavior may be influenced by experiences in childhood as well as in adolescence.¹⁹ A focus on adolescent health engagement reinforces the importance of health promotion among both children and adolescents, for example, through school health services and national campaigns.

From a methodologic perspective, 1 strength of this study was the large, prospective, nationally representative data set, with its low attrition rates and negligible nonresponse bias for most health outcomes. Although the statistical significance of these results is aided by the large sample size, the magnitude of the effect of unmet need, and its persistence across different categories of unmet need for all sociodemographic groups, suggests this effect is important for clinical and policy purposes. The study included a widely used measure of unmet health care need in adolescence and 5 outcome measures that do not depend on diagnosis by a health care professional, and thus are less subject to bias among participants who have not accessed health care services. The robustness of the main findings was supported by sensitivity analyses using regression models with imputation of missing data and double robust estimates. One limitation is our

inability to exclude unmeasured confounding; as discussed earlier, it is possible that some of these associations reflect unmeasured aspects of adolescent psychosocial factors and/or socioeconomic status. A further limitation is that the subgroup analyses comparing the reasons for unmet health care need had smaller sample sizes; therefore, small differences in health outcomes between the different categories of unmet need may have gone undetected.

As with self-reported health measures,²⁰ there are strengths and limitations of using a self-reported measure of unmet health care need. The construct of unmet health care need sits at the intersection of clinical need and a range of factors that influence health care-seeking behavior, from insurance coverage and other access factors to individuals' beliefs and preferences regarding their health. Although self-reported measures of unmet need are clearly more subjective than assessment by an independent expert, they have the advantage of capturing participants' greater understanding of their own health and health care needs.²¹ Self-reported measures of unmet need may be particularly useful in studying an adolescent population, which has relatively high perceived barriers to accessing health care⁴ (consistent with the increasing focus on opportunistic health promotion during all adolescent consultations).

Regarding the generalizability of these findings for health care policy and practice, the study is restricted to the United States, and adolescent data were collected in 1993/1994, before successive reforms to the US health care system and consensus national recommendations were published regarding the timing and content of preventive care for adolescents. Despite these limitations, we believe that our findings have broad international relevance; as noted

earlier, there is widespread recent evidence of unmet health care need among adolescents in the United States^{22,23} and other countries.^{4,24} Although the reasons for unmet need may vary between countries and over time, our data show that unmet need for any reason is associated with poor adult outcomes.

These findings reinforce the importance of early intervention and investment to improve adult health. Reducing unmet health care need among pregnant women and young children is known to improve long-term health outcomes and reduce health care utilization.¹¹ Our findings are consistent with suggestions that adolescence may be a second critical developmental window influencing adult health status and behaviors.²⁴ To the extent that the relationship between unmet adolescent need and health outcomes is causal (not demonstrated in these data), reducing unmet health care need among adolescents has the potential to improve population health in 2 ways. First, unmet health care need in adolescence predicts poor adult health outcomes, independent of baseline health status. Reducing unmet need may be seen as improving the gradient of health trajectories between adolescence and adulthood. Second, it is likely to improve the health status of adolescents themselves (the starting point of these trajectories).⁷ Adolescent health status is important in itself, and was also the strongest predictor of adult outcomes in our models.

Another important implication of this study is that health care reforms in the United States and elsewhere should look beyond cost barriers to health care access, and address the wider issues of health engagement and health care quality/access among adolescents. Insurance coverage for adolescents is clearly important, and cost continues to be a barrier to accessing health care for some US

adolescents, despite the recent health care reforms.²⁵ However, we found that unmet health care need was common in all insurance categories and sociodemographic groups. Policies that aim to increase insurance coverage alone are not sufficient to ensure high-quality health care that meets the needs of patients and improves long-term health outcomes.²⁶ US and international evidence shows that adolescents forgo health care for many reasons, including concerns about confidentiality, cost, being treated with lack of respect, staff unfriendliness, and poor communication.^{2,5,6} In particular, young people with mental health needs may perceive many barriers to accessing care, and the ability of health care providers to engage and communicate well is crucial to the initiation and success of treatment.²⁷ Interventions have been shown to improve the perceived quality of consultations with young people and increase utilization, particularly among the most vulnerable adolescents.^{2,6,15} In turn, there are good reasons to believe that increased utilization of health services among adolescents may result in improved adult health outcomes. For example, approximately one-half of lifetime mental health disorders appear by age 14 years and 75% by age 24 years.²⁸ Early diagnosis and treatment can improve short- and long-term health outcomes, as well as reduce overall health care costs.²⁹

CONCLUSIONS

Unmet health care need in adolescence is common and is an independent predictor of poor adult health. Whereas interventions to improve health care access among adults have had limited impact on future health and health care costs,^{30,31} reducing unmet health care need among adolescents may be a highly effective investment to

improve population health outcomes and reduce health care costs. Strategies to reduce unmet need among adolescents should address health engagement and care quality, as well as cost barriers to accessing services.

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ABBREVIATIONS

aOR: adjusted odds ratio
CI: confidence interval

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