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Trends and Characteristics of Preventive Care Visits among Commercially Insured Adolescents, 2003–2010

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Abstract

Objective—To examine preventive care visit patterns among commercially insured adolescents during 2003–2010. In 2005–2007, the Advisory Committee on Immunization Practices (ACIP) recommended 3 vaccines targeted at adolescents. We also investigate the relationship between preventive care visits and immunization.

Study design—Data were drawn from the MarketScan database. Adolescents aged 11–21 continuously enrolled in the same insurance plan during the calendar year were included. We calculated the annual proportion of adolescents with at least 1 preventive and 1 vaccination-related visit. Longitudinal analyses were conducted by following the 1992 birth cohort for 8 consecutive years.

Results—The proportion of adolescents making at least 1 preventive visit increased from 24.6%–41.1% during 2003–2010. The rate of vaccination-related visits increased from 12.9%–26.3%. The magnitude of the increase in preventive and vaccination-related visits was greater during the years in which ACIP issued recommendations. The rates of preventive and vaccination-related visits were considerably higher among female and early adolescents and adolescents in managed care plans. Longitudinal analyses indicated that only 2.4% of adolescents had an annual preventive visit during the 8 years.

Conclusions—Yearly improvements in preventive care visits by adolescents were substantial. ACIP recommendations may be associated with this improvement. However, ongoing efforts are needed to improve the use and delivery of preventive care services.

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Preventive care is of particular importance during adolescence as this is the period during which healthy habits are developed and risky behaviors are likely to start. Healthcare professionals and government officials have published clinical guidelines to address the importance of preventive care.[1–3] For example, *Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents*[3] recommends that adolescents receive an annual preventive care visit. Although considerable efforts have been devoted to increasing the use of preventive services, studies have documented that the annual proportion of adolescents seeking preventive care is low.[4–9]

An important component of preventive services is immunization. Over the past decade, 3 vaccines targeted at adolescents aged 11 and 12 have been recommended by the Advisory Committee on Immunization Practices (ACIP): meningococcal conjugate vaccine was recommended in 2005,[10] the tetanus and diphtheria toxoids and acellular pertussis vaccine was recommended in 2006,[11] and human papillomavirus vaccine (HPV) was recommended for use in females in 2007.[12] The coverage of these newly recommended vaccines is not optimal.[13] A main barrier identified in the literature is the lack of routine preventive care visits among adolescents.[14]

Studies have examined preventive visit patterns among adolescents. These studies, however, are limited in reporting an overall visit rate or visit rates by subgroups[4–7] (changes in preventive visit patterns over time are not available) and in using cross-sectional data[5,6] (they could not identify whether changes in visit patterns were due to changes in the composition of the study population or to changes in visit patterns by individuals). This study adds to the current literature by providing in-depth investigation of the time trend in preventive care visits by adolescents. We also conduct longitudinal analyses of preventive visit patterns by individual enrollees.

Methods

The study uses the Commercial Claims and Encounters database portion of the MarketScan Databases for the years 2003–2010. The Commercial Claims and Encounters data track insurance claims from providers using a nationwide sample of employees and dependents covered by large self-insured employers and regional health plans. The dataset expands dramatically over the years and contains a large proportion of the US commercially insured population, ranging from ~8 million individuals in 2003 (~2.6% of the US population) to 45 million in 2010 (~14.7% of the US population).

Our analyses included adolescents aged 11–21 years during at least 1 of the study years. We focused on those who were continuously enrolled in health insurance plans during each calendar year. Adolescents were divided into 3 age groups based on the Bright Futures guidelines, early adolescence (11–14 years old), middle adolescence (15–17 years old), and late adolescence (18–21 years old), to explore age differences in preventive care visits.

This study was reviewed by the Human Subjects Coordinator at the Centers for Disease Control and Prevention. As an analysis of secondary data without identifiers, this study did not require institutional review board review.

Based on the Healthcare Effectiveness Data and Information Set (HEDIS),[15] we used the *International Classification of Diseases-9th Revision* codes associated with routine medical examinations to define preventive care visits (ie, V20.2, V70.0, V70.3, V70.5, V70.6, V70.8, and V70.9). Outpatient records with the Current Procedural Terminology codes between 99381 and 99397 (ie, comprehensive preventive care) were also defined as preventive care visits. Our data indicated that comprehensive preventive care was provided in over 80% of the preventive care visits. Outpatient visits with *International Classification of Diseases-9th Revision* codes or Current Procedural Terminology codes associated with vaccine administration were classified as vaccination-related visits. Note that preventive care and vaccination-related visits are not mutually exclusive.

We considered 7 types of health care providers/agencies: pediatricians, family physicians, internists, obstetricians and gynecologists, specialists/subspecialists, non-physician professionals, and health care facilities or agencies.

Preventive care visit rate was measured by calculating an annual proportion of adolescents who had at least 1 preventive care visit. We compared these annual proportions particularly among 3 time periods: 2003–2004 (pre-recommendation), 2005–2007 (transition), and 2008–2010 (post-recommendation). The same approach was used to study the pattern of vaccination-related visits. Rates of preventive care and vaccination-related visits were also examined by subgroups. To assess changes in visit patterns by individual enrollees, we follow the 1992 birth cohort for 8 consecutive years.

Including preventive care provided by specialists/subspecialists may be subject to coding errors. Thus, a sensitivity analysis was performed by excluding preventive visits to specialists/subspecialists (ie, coded as outpatient visits, not preventive visits).

Results

A total of 4 732 297 adolescents were included, representing 11 933 132 outpatient visits during the 8 years. The size of the study population increased from 924 381 to 1 983 226 during 2003–2010 (Table I). In each year, about 51% were males and 49% were females, and approximately 37%, 30%, and 33% were in their early, middle, and late adolescence, respectively. Most of our study population resided in the south and north central regions (61%) and in metropolitan statistical areas (MSAs) (over 80%). Preferred provider organization was the most prevalent health plan among adolescents.

Preventive Care Visits

During 2003–2010, the proportion of adolescents making at least 1 preventive visit increased from 24.6% to 41.1% (Table II). Although the time trend in preventive visits generally increased, the magnitude of the increase was greater during transition years compared with pre- and post-recommendation years.

Rates of preventive care visits within each subgroup were significantly different at the 1% level. The trends, however, were similar to the overall trend. Compared with their counterparts, the rate of preventive care visit was significantly higher among females and

adolescents living in the northeast region, in MSAs, and in managed care insurance plans. Examining preventive visit patterns by age group and sex, the proportion of preventive care visits was higher among early adolescents than middle and late adolescents (Figure). The age difference, however, was noticeably smaller for females, especially during the pre-recommendation period.

Preventive Care Visits by Provider Type

Preventive care visits made by early adolescents were to pediatricians (61.1%). The number dropped to 20.4% for late adolescents. Visits to family physicians rose with age for males (35.8% for late adolescents) and visits to obstetricians and gynecologists increased with age for females (32.5% for late adolescents); 11.3% of preventive care visits made by adolescents of all ages were to specialists/subspecialists; preventive visits to other provider types accounted for 8.6% of all preventive visits.

The rate of preventive care provided by pediatricians increased over time, from 35.7% in 2003 to 50.0% in 2010. Most of the increase was due to older adolescents (15–21 years) increasing their visit to pediatricians over time.

Vaccination-Related Visits

The proportion of adolescents making at least 1 annual vaccination-related visit increased from12.9%–26.3% during 2003–2010. Visit rates were higher during transition years (an average of 39.5%) compared with pre- and post-recommendation years. Early adolescents and adolescents in the northeast region, in MSAs, and in managed care plans had a higher vaccination-related visit rate compared with their counterparts. The sex difference in vaccination-related visits was small during pre-recommendation year; it became statistically significant at the 1% level since 2005 with a higher rate for females. Between 2006 and 2007, the visit rate of females rose dramatically in all age groups.

Preventive Care Visits vs Vaccination-Related Visits

Between 2003 and 2010, the proportion of adolescents who received a vaccine during a preventive visit increased by 45.9% and 78.7% for males and females, respectively. Most of this increase occurred during the transition period. This suggested that the proportion of vaccines delivered during a preventive visit increased rapidly since ACIP issued recommendations. There was a decrease starting in 2008, which may be a reflection of older adolescents not needing vaccines during their preventive visits since they were vaccinated earlier.

Among adolescents who made a vaccination-related visit, the proportion of adolescents who also received preventive services diverged between sexes since 2006. This may reflect the large number of females receiving HPV as recommended by ACIP in 2007.

Longitudinal Analysis

We constructed an 8-year longitudinal data by restricting our study population to the 1992 birth cohort (11 years old at the end of 2003). In doing so, we were able to track changes in preventive visit patterns by individual enrollees across their adolescence (from 11 to 18

years old between 2003 and 2010). Twenty-one thousand four hundred fifty-one (27.2%) adolescents of the 1992 birth cohort met the sample inclusion criteria and were included in the analysis.

During the 8 years, 18.2% of males and 13.8% of females had not made any preventive care visits. The mean number of preventive visits was 3.6 and 3.9 for males and females, respectively (Table III). Only 2.4% of adolescents made at least 1 preventive care visit each year throughout this 8-year period and the numbers were very similar between sexes. The proportion of adolescents who had not made any vaccination-related visit during the same time period was 25.2% for males and 21.9% for females.

The time trend in preventive care visits was very similar to the trend using the full sample. Between 2003 and 2010, there was a large increase in the proportion of adolescents with at least 1 preventive visit (from 27.7%–37.3%, $P < .01$). The proportion increased from 28.5%–32.0% for males and from 26.7%–42.7% for females and the increase was greater during transition years for both sexes.

Sensitivity Analysis

Results were very similar if we excluded preventive care provided by specialists/subspecialists. The rate of preventive visits by adolescents increased from20.7%–37.2%during 2003–2010.

Discussion

Yearly improvements in preventive care visits for adolescents were substantial between 2003 and 2010. The rates, however, were far from optimal in relation to the recommendations by Bright Futures. Several studies have documented barriers to access and to provision of preventive care services, including low income, not having continuous insurance coverage, lack of confidentiality, limitations on choices of providers, physician attitudes and beliefs, and lack of provider training.[4,16–21] Although expansions in Medicaid and State Children's Health Insurance Programhave improved adolescents' access to health care services,[22] and several intervention strategies have been proven to be effective in addressing these barriers,[23–25] our result suggests that ongoing efforts are needed to further promote the use and delivery of preventive care.

Our findings revealed that preventive visit rate was considerably lower among middle and late adolescents. Although the goals of vaccination are to vaccinate as early as possible, adolescents would be best served if they had preventive visits when they were initiating risky behaviors (middle adolescence). Thus, efforts to increase preventive visits among all ages during adolescence are important.

Several findings suggested that ACIP recommendations were associated with the increase in adolescents' vaccination-related visits. First, the average growth rate of vaccination-related visits was higher during the years in which ACIP issued recommendations. Second, most vaccines recommended were targeted at early adolescents, which was consistent with the finding that visit rate was higher among early adolescents. Finally, HPV was recommended

in 2007. As a result, females in all age groups were more likely to make a vaccination-related visit after 2006. Our data showed a decrease in vaccination-related visits among middle and late adolescent females during 2009–2010. This may result from a cohort effect because older females may have received all recommended vaccines at an earlier age, thereby reducing their need for vaccination-related visits.

Similar trends in preventive and vaccination-related visits are consistent with the notion that immunization could act as a hook to increase healthcare visits, which may provide an opportunity for the delivery of other types of preventive care services.[26]

Our longitudinal analyses indicated that only 2.4% of adolescents made an annual preventive care visit and 16.1% had not made any preventive visit during the same time period. These results reinforce our earlier conclusion that significant efforts have to be made to increase the use of preventive services among adolescents.

Our findings should be interpreted in light of some limitations. First, our data show that preventive care visits increased rapidly during the years that ACIP issued recommendations. The causal relationship, however, is not statistically tested and other factors may play a vital role in the improvement in preventive visits. For example, the fact that the proportion of adolescents making at least 1 preventive care visit is a HE-DIS measure[27] and the publication of several clinical guidelines[1,3,28] may have led to increases in preventive care visits. Moreover, changes in insurance coverage, in reimbursements for preventive care and immunization services, or in regional or school requirements for immunization and regular preventive care visits may also play a role. However, preventive care visits for adolescents have been adopted as a HEDIS measure since 1996[29] and the clinical guidelines were published before our study years. Moreover, we are not aware of any significant change in insurance coverage, reimbursement policy, or in regional or school requirements during transition years. Therefore, these factors are not likely to play a major role in explaining the rapid increase in preventive care visits by adolescents during the transition years.

Other limitations come from the MarketScan data. First, the data were generated from insurance claims and thus included in-plan outpatient visits. We may therefore underestimate preventive care or vaccination-related visits because of the inability to track non-recorded health care visits by adolescents. On the other hand, our definition of preventive care visits includes both routine medical examinations and comprehensive preventive services, which might overestimate the rate of preventive care visits. However, over 80% of the preventive visit records in our data indicated that comprehensive preventive care was provided and these services were coded by physicians. Therefore, we believe that our number represents an acceptably accurate proportion of commercially insured adolescents making an annual preventive visit. Second, the number of our study population increased dramatically during our study period, which, to some extent, may contribute to changes in the rates of preventive and vaccination-related visit. However, the results from the longitudinal analysis confirmed the increasing time trend in preventive visits and also suggested that preventive care is underutilized by adolescents. Third, our study population included adolescents continuously enrolled in a private insurance plan, which limited generalizability to the US population. The low preventive care visit rate among commercially insured adolescents, however, raises

serious concerns as this group is likely to represent a better scenario compared with the uninsured population.

Our study adds to the current literature by presenting time trends in preventive care visits by commercially insured adolescents over an 8-year period. Although ACIP recommendations and a variety of policies and efforts might have been associated with the substantial improvement in adolescents seeking preventive care, the results indicate that innovative interventions are necessary to promote further increases in the uptake of preventive services by adolescents.

Glossary

ACIP	Advisory Committee on Immunization Practices
HEDIS	Healthcare Effectiveness Data and Information Set
HPV	Human papillomavirus vaccine
MSA	Metropolitan statistical area

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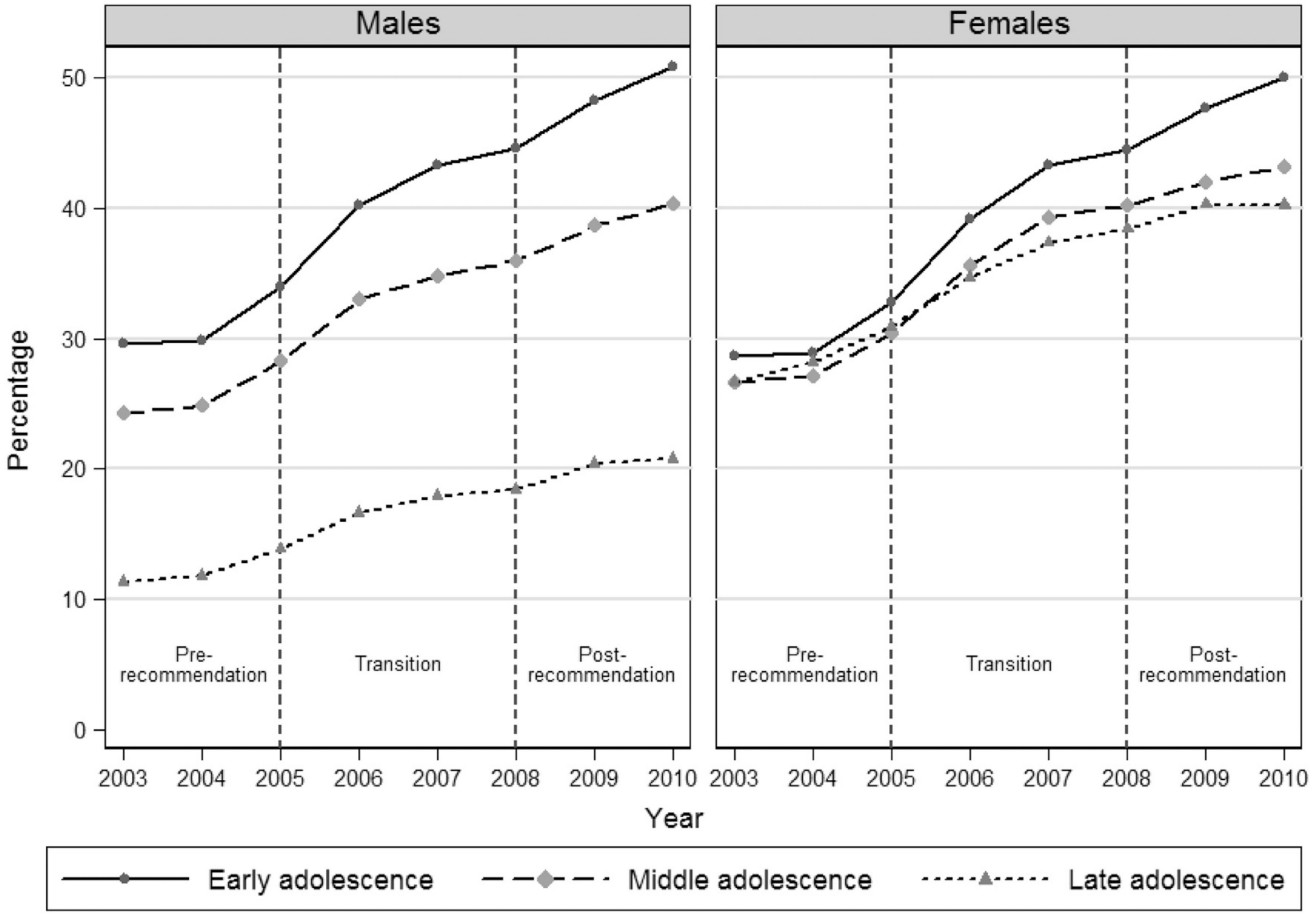

Figure.

Percentage of adolescents having at least 1 preventive care visit, 2003–2010 by sex and age group.

Table I

Characteristics of study population by year, 2003–2010 MarketScan database*

	Pre-recommendation		Transition			Post-recommendation		
	2003	2004	2005	2006	2007	2008	2009	2010
Number of adolescents	**924 381**	**1 027 624**	**1 183 285**	**1 284 699**	**1 622 938**	**1 863 651**	**2 043 328**	**1 983 226**
Sex								
Male	50.6	50.6	50.6	50.6	50.5	50.5	50.5	50.6
Female	49.4	49.4	49.4	49.4	49.5	49.5	49.5	49.4
Age group								
Early (11–14 y)	36.6	36.9	36.8	36.5	36.6	36.5	36.7	36.3
Middle (15–17 y)	29.3	30.0	30.5	30.7	30.4	30.0	29.8	29.4
Late (18–21 y)	34.1	33.1	32.6	32.8	33.0	33.5	33.5	34.3
Region								
Northeast	11.0	8.7	10.8	12.1	12.2	12.4	14.3	14.1
North central	26.1	29.6	27.1	27.4	26.8	26.6	24.5	23.9
South	35.9	37.7	40.3	37.0	37.8	36.8	37.2	37.6
West	26.9	24.0	21.8	23.6	23.2	24.3	24.0	24.4
MSA								
Yes	80.0	78.8	83.6	86.1	85.8	86.7	87.6	87.7
No	20.0	21.2	16.4	13.9	14.2	13.3	12.4	12.3
Insurance type								
FFS	13.7	11.1	7.1	6.4	2.5	2.4	2.0	2.4
Managed care plans								
HMO	27.0	25.1	25.6	28.8	26.4	26.6	24.5	23.2
POS	21.3	18.5	16.8	17.1	15.6	14.7	12.7	11.3
PPO	38.0	45.3	50.4	47.7	55.5	56.3	60.8	63.1

FFS, fee-for-service; *HMO*, health maintenance organization; *POS*, point of service; *PPO*, preferred provider organization.

*Numbers are expressed as percentages.

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Table II

Percentage of adolescents having at least 1 preventive care visit, 2003–2010 MarketScan database

	Pre-recommendation		Transition			Post-recommendation		
	2003	2004	2005	2006	2007	2008	2009	2010
Number of adolescents	**924 381**	**1 027 624**	**1 183 285**	**1 284 699**	**1 622 938**	**1 863 651**	**2 043 328**	**1 983 226**
Full Sample	24.6	25.3	28.6	33.5	36.3	37.2	39.8	41.1
Sex *								
Male	21.9	22.5	25.8	30.4	32.5	33.4	36.2	37.6
Female	27.4	28.1	31.5	36.6	40.1	41.1	43.5	44.6
Age group *								
Early (11–14 y)	29.2	29.4	33.4	39.7	43.3	44.5	48.0	50.5
Middle (15–17 y)	25.5	26.0	29.3	34.3	37.0	38.1	40.3	41.8
Late (18–21 y)	19.0	20.0	22.4	25.7	27.7	28.5	30.4	30.5
Region *								
Northeast	49.1	47.1	52.5	55.3	58.7	60.4	61.4	61.8
North central	21.7	23.8	27.3	32.2	35.4	36.7	40.0	41.6
South	19.4	20.8	24.2	28.7	31.7	33.3	36.0	36.4
West	24.4	26.1	26.4	31.2	32.9	32.0	32.6	35.8
MSA *								
Yes	27.3	27.9	30.8	35.3	38.3	39.0	41.6	42.8
No	13.8	15.7	17.1	22.2	24.1	25.5	27.3	28.6
Insurance type *								
FFS	14.1	13.4	15.8	19.0	25.2	24.8	29.3	25.7
Managed care plans								
HMO	31.0	31.4	32.7	38.0	41.2	41.6	42.1	44.4
POS	34.2	33.7	36.6	37.6	39.2	40.6	44.0	42.6
PPO	18.5	21.3	25.6	31.2	33.6	34.8	38.4	40.2

Outpatient visits with *International Classification of Diseases-9th Revision* codes: V20.2, V70.0, V70.3, V70.5, V70.6, V70.8, and V70.9 or Current Procedural Terminology codes between 99381 and 99397 are defined as preventive care visits.

* Differences within groups are statistically significant at the 1% level during each of the study years.

Table III

Longitudinal analysis on the percentage of adolescents having at least 1 preventive care visit, 2003–2010 MarketScan database

	Preventive care visits	
Having at least 1 visit	**Male**	**Female**
For 1 y	15.4	15.4
For 2 y	14.9	16.2
For 3 y	14.1	15.1
For 4 y	13.0	13.5
For 5 y	9.9	10.9
For 6 y	7.8	7.7
For 7 y	4.5	5.0
For 8 y	2.3	2.5
No visit during the 8 y	18.2	13.8
Mean number of visits	3.6	3.9

Adolescents included were those born in 1992 and enrolled in the same insurance plan for 8 years.