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The Influence of Deductible Health Plans on Receipt of the Human Papillomavirus Vaccine Series

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Abstract

Objective—To evaluate whether enrollment in deductible health plans (DHP), with higher patient cost-sharing requirements than traditional HMO plans (HMP), decreased initiation and completion of the HPV vaccine series, recommended for prevention of cervical cancer.

Methods—This was a retrospective observational study of 9-26 year old females at Kaiser Permanente Georgia (KPGA) and Kaiser Permanente Colorado (KPCO) who were HPV vaccine naïve at time of enrollment in a self-pay DHP or HMP in 2007. Estimates of rates of initiation and completion of the HPV vaccine series from plan enrollment in 2007 through 12/2009 were obtained using Cox proportional hazards (CPH) regressions (accounting for censoring) on samples matched on the propensity to enroll in a DHP vs. HMP.

Results—Initiation of the HPV vaccine series was 22.2% and 24.4% in the DHP and HMP, respectively, at KPGA; and, completion was 12.3% and 14.4% in the DHP and HMP, respectively. HPV vaccine series initiation was higher at KPCO; but, completion was lower. In the CPH regressions, rates of initiation and completion of the HPV vaccine series did not significantly ($p = 0.05$) differ by plan type (DHP vs. HMP) at both sites. The primary care visit rate included in these regressions had a significant, positive association with initiation and completion of the HPV vaccine series.

Conclusions—Enrollment in a DHP vs. HMP did not directly affect initiation or completion of the HPV vaccine series among age-eligible females. Independent of plan type, more frequent primary care visits increased initiation and completion rates.

Keywords

HPV vaccine; Deductible health plans; HMOs; Patient cost-sharing; Cancer; Preventive care

Introduction

Beginning in the early 2000s, HMOs responded to employers' requests to broaden insurance products beyond traditional health maintenance plans (HMPs) by introducing deductible health plans (DHPs), sometimes referred to as high deductible or consumer directed health plans. DHPs rely on consumers to manage health care cost inflation [1-2], in part by increased patient cost-sharing for selected services. Consumers are assumed to be price sensitive and, therefore, reduce demand for medical services – more for discretionary or ineffective medical services and less for effective prevention services – when their out-of-pocket costs for medical services increase [3-6].

Randomized controlled trials of the effect of DHPs vs. HMPs on receipt of medical services have not been conducted, so evidence on possible DHP effects must be obtained from survey and observational studies. A survey of the US national population found that 31% of adults enrolled in a DHP reported “delayed or avoided” care due to plan costs compared to 17% in comprehensive plans [7]. Observational studies have found mixed evidence that DHP enrollment might decrease receipt of recommended prevention services, such as screening mammograms, Pap tests, well-child visits, and lipid screening [8-12].

The 3-dose human papillomavirus (HPV) vaccine series is a recommended, effective cancer prevention service. The Advisory Committee on Immunization Practices recommended in June 2006 (published in March 2007) a 3-dose vaccine series with the second and third doses administered 2 and 6 month, respectively, after the first dose [13]. The recommended age for vaccination of females is 11–12 years, but the vaccine can be administered as early as age 9. Catch-up vaccination is recommended for females aged 13-26 years who have not been previously vaccinated [14].

Some studies which have examined whether receipt of the HPV vaccine series might be affected by insurance status have found that receipt of the HPV vaccine series is higher among privately insured compared to publicly insured patients [15-17]; however, when uninsured or underinsured patients can receive the HPV vaccine series at no cost, receipt of the series is similar [18]. Receipt of the HPV vaccine series may be sensitive to patient cost-sharing level. One survey found “moderate” cost vs. “free” HPV vaccination decreased intention to vaccinate [19].

Like most recommended screening or prevention services provided by HMOs, the HPV vaccine series is usually exempt from patient cost-sharing, such as copayments or coinsurance. Recommended screening and prevention services, nevertheless, might be affected by the higher cost-sharing provisions of DHPs compared to the lower cost-sharing provisions of HMPs for several reasons.

One reason is possible confusion among insured patients about covered services, specifically which services are exempt from copayments and deductibles [20-21]. A survey of Kaiser Permanente adults enrolled in a DHP found that 84% knew their plan included a deductible, however, 48% were unaware that prevention services required little or no out-of-pocket costs [21]. Confusion and uncertainty may result in deferred receipt of recommended cancer screening services such as mammograms or colorectal cancer screening [20]. One study

found that parental intention to initiate the HPV vaccine series among age-eligible daughters was more likely among those who believed that their insurance covered the cost of the HPV vaccine series than among those who believed the cost was not covered [22].

Another reason is the indirect effect on receipt of prevention services that might occur because of the sensitivity of primary care visit rates to cost sharing. Primary care visits – whether for preventive, acute, or chronic care – represent opportunities for assessing, counseling, recommending, and providing screening and prevention services [23-26]. Intended or actual receipt of HPV vaccinations has been associated with physician recommendation or frequency of physician contact [17, 27-30]. Primary care visit rates, however, decrease with increased patient cost-sharing [5]. Physician visits are more costly, on average, for DHP enrollees than HMP enrollees because of copayment differentials, coinsurance, and annual deductibles. Thus, higher patient cost-sharing of DHPs may decrease opportunities for ascertaining and ensuring that patients receive the HPV vaccine series.

The objective of our study was to evaluate the influence of DHP vs. HMP enrollment on initiation and completion of the 3-shot HPV vaccine series. One working hypothesis was that DHP vs. HMP enrollment would result in significantly decreased rates of initiation and completion of the HPV vaccine series among age-eligible females, attributable to the possible confusion of some HMO enrollees about which services are exempt from DHP copayments and deductibles. The other working hypothesis was that part of the effect of DHP vs. HMP enrollment on receipt of the HPV vaccine series might be indirect. With higher cost-sharing in DHPs, primary care visit rates would be lower than in HMPs; and, DHP enrollees would have opportunities for physicians to assess, inform, and motivate them to be up-to-date on recommended prevention services.

Methods

Setting

Kaiser Permanente Georgia (KPGA) and Kaiser Permanente Colorado (KPCO) were the first Kaiser Permanente (KP) regions to introduce DHPs beginning in 2003. At the time of this study, KPGA provided comprehensive medical services to approximately 260,000 enrollees (59% Caucasian, 33% African American) in the Atlanta area. KPCO provided comprehensive medical services to approximately 470,000 enrollees (70% Caucasian, 17% Hispanic) in the Denver/Boulder area. The study protocol was reviewed, approved, and monitored by the IRBs of both study sites.

Sample Definition

The primary sample used in analysis for this paper consisted of 9 to 26 year old females who obtained KP insurance through a self-pay (sometimes called individual- or direct-pay) DHP or HMP selected in 2007 (N=3,676 at KPGA; 2,533 at KPCO). Additional criteria included: HPV vaccine naïve and enrolled with KP for at least 12-months prior to 2007 plan selection.

Samples were also defined for age-eligible females with KP insurance through an employer-sponsored DHP or HMP. Employer sponsored plans can be classified into two types:

employers who offer employees a choice of a KP DHP or HMP (typically small and mid-size employers) and those who offer only a KP DHP or HMP (typically large employers). We focused on self-pay plans because of the higher levels of cost-sharing required of patients and families compared to employer-sponsored plans offering DHPs. For example, at KPGA median annual family deductible in self-pay plans was \$6,000 compared to \$1,500 in employer plans offering a DHP or HMP choice and \$400 in employer plans offering no choice. If any cost-sharing effect of DHPs on receipt of the HPV vaccine series were to be observed, it would most likely be in the self-pay plans.

Research Design

A quasi-experimental design was used to reduce the effect of DHP vs. HMP selection bias on HPV vaccine series initiation and completion. First, propensity to be enrolled in a DHP vs. HMP at the time of health plan eligibility in 2007 was estimated with logistic regression [31-33]. Second, based on the estimated propensity of DHP vs. HMP enrollment, each DHP patient was matched with a HMP patient. Third, the associations of time to initiation and to completion of the HPV vaccine series with DHP vs. HMP enrollment were estimated in the matched sample with Cox proportional hazards (CPH) regression.

Data Sources

All analyses used computerized administrative data: enrollment eligibility and demographic data, contracts and benefits data, and health care utilization data (for tracking HPV vaccination uptake and pre-existing medical conditions). Records were linked by unique patient, family account, and contract numbers and sequenced by event dates.

Measures

Time to Initiation and Time to Completion of HPV Vaccine Series—Two dependent variables were examined: time to initiation and time to completion of the HPV vaccine series. Initiation and completion times were measured from the 2007 “eligibility month” (i.e., the month in 2007 when the DHP vs. HMP selection occurred). Both were measured in months, starting with the 2007 eligibility month and including the month in which the series was initiated or completed. Censoring occurred if an age-eligible female at the 2007 eligibility month: had not initiated or completed the series by December 31, 2009, reached the age of 27 prior to December 31, 2009, or disenrolled from the health plan prior to December 31, 2009. Separate censoring times were computed for the initiation and completion times.

Plan Type—The primary independent variable was KP insurance plan at the 2007 eligibility month. The independent variable was defined as both binary (DHP vs. HMP) and categorical by level of annual family deductible in DHPs. During the 2007-2009 study period, families might change plan type. Essentially no families switched from to self-pay DHPs from self-pay HMPs (<1%) and, within DHPs, those who switched (10-20% per year) selected higher annual family deductibles.

Covariates—The covariates included: age at the 2007 eligibility month, whether the patient was the subscriber (i.e. not a parent or husband), family composition, and both

patient and family indicators for 8 “pre-existing” (i.e. ascertained prior to the 2007 eligibility month) major comorbidities. Comorbidities were identified at the individual-level using computerized medical record data on diagnoses, procedures, prescribed medications, and laboratory results records and assigned an approximate ascertainment date. A “family comorbidity” was considered to be present if any of the in a family had a pre-existing comorbidity.

Neighborhood socioeconomic (SES) index was based on a validated scale using US Census tract-level measures [34]. The SES index was concordant with individual SES obtained from selected surveys of KPGA adults. Individual race and SES were infrequently available and, therefore, not used as covariates.

The primary care visit rate was defined as the number of face-to-face physician or mid-level provider visits in Pediatrics, Adult or Family Medicine, Obstetrics/Gynecology, or After Hours Care (visits for acute, self-limiting conditions outside routine office hours) in the 12-month period beginning with the 2007 eligibility month.

Statistical Analyses

Distributions of patient and family characteristics and percents of patients who initiated or completed the HPV vaccine series were compared for DHP vs. HMP using χ^2 tests. Distributions of median time to initiation or completion of the HPV vaccination series of patients in the DHP and HMP groups were compared using a likelihood ratio test.

Propensity to select a DHP vs. HMP at the 2007 eligibility month was estimated using logistic regression including the following independent variables: patient age, subscriber age and gender, a binary variable of whether the patient was the subscriber, family composition, family comorbidities, and neighborhood SES. We used family comorbidities and neighborhood SES in models to adjust for propensity to select a DHP vs. HMP because previous research suggests that factors such as lower health risk profiles and availability of greater financial resources are associated with DHP enrollment [35-36].

This logistic regression model resulted in a probability estimate of DHP vs. HMP selection. Matching of one DHP patient with one HMP patient was done using a caliper of 0.02. Sensitivity of matching was tested with a caliper of 0.002, with little difference in results. Distributions of independent variables before and after propensity score matching were compared using χ^2 tests.

Linear regression models of primary care rates in the 12-months following plan enrollment were estimated using the matched sample. Two model specifications were estimated: 1) DHP vs. HMP enrollment (Model 1) and 2) DHP by level of annual family deductible vs. HMP enrollment (Model 2), adjusted for patient age, comorbidities, and area-based SES. These models allowed for assessment of the influence of plan type (Model 1) and level of DHP cost-sharing (Model 2) on primary care visit rates.

CPH regression models of time to initiation and time to completion of the HPV vaccine series as a function of plan type were estimated using the matched sample. Two models specifications were estimated for initiation and completion: 1) DHP vs. HMP enrollment

(Model 1) and 2) DHP vs. HMP enrollment and primary care visit rates, adjusted for patient age, comorbidities, and area-based SES. Results from the two models allowed for assessment of whether part of the direct effect of plan type (Model 1) on initiation or completion of the HPV vaccine series might be moderated by the effect of plan type of primary care visit rates (Model 2).

Results

Descriptive statistics by plan type and site are presented in Table 1. Individuals and families who enrolled in a DHP were relatively healthier than those who enrolled in a traditional HMP. For example, at KPGA, 3.6% of DHP enrollees were in families with one or more family members with pre-existing diabetes whereas 6.6% of HMP enrollees were in families with one or more family members with pre-existing diabetes. Similarly, 6.7% of females age-eligible for HPV vaccinations and enrolled in a DHP in 2007 had pre-existing asthma compared to 9.7% of age-eligible females enrolled in a HMP in 2007.

Matching based on propensity to enroll in a DHP vs. HMP reduced the KPGA sample to 794 DHP enrollees matched with 794 HMP enrollees and the KPCO sample to 405 DHP enrollees matched with 405 HMP enrollees. Family and patient characteristics (Table 1) did not significantly differ between DHPs and HMPs after propensity score matching.

In the propensity score matched datasets, age-eligible females enrolled in a HMP were more likely than those enrolled in a DHP to initiate the HPV vaccine series (KPGA: 24.3% vs. 21.7%; KPCO: 46.2% vs. 31.1%; Table 2). The median time to initiation of the HPV vaccine series was slightly longer among HMP vs. DHP enrollees at KPGA, but equal at KPCO.

HMP enrollees were also more likely than DHP enrollees to complete the HPV vaccine series (KPGA: 14.4% vs. 12.3%; KPCO: 19.3% vs. 9.1%; Table 3). The median time to completion of the HPV vaccine series was longer by about one month among HMP vs. DHP enrollees at both sites.

Adjusted for patient age, comorbidities, and neighborhood SES, DHP enrollees compared to HMP enrollees had significantly lower annual primary care visit rates in the first 12-months following plan enrollment (KPGA: 1.59 fewer visits; KPCO: 1.68 fewer visit; Table 4). At both study sites, the decreased annual primary care visits among age-eligible females enrolled in a DHP was particularly noteworthy among those with an annual family deductible >\$5,000 (KPGA: 1.83 fewer visits; KPCO: 1.77 fewer visits).

Table 5 presents hazard ratios (HR) for time to initiation and completion of the HPV vaccine series with and without conditioning on primary care visits during the first 12-months after plan enrollment. At KPCO, initiation, but not completion, of the HPV vaccine series was significantly lower among DHP enrollees (adjusted HR=0.789) in the model without primary care visit rates. When primary care visit rates were included, neither the initiation nor completion rate was significantly ($p < 0.05$) associated with plan type at KPGA or KPCO. Primary care visit rates in the 12-months following plan enrollment were consistently, significantly associated with rates of initiation and completion of the HPV vaccine series –

higher visit rates being associated with higher initiation and completion rates. Other factors that were significantly associated with initiation and completion of the HPV vaccine series (data not shown, available on request) were age (highest among 13-15 year olds, lowest among 19-26 year olds) and comorbid asthma (higher initiation and completion rates).

Discussion

Overall, less than the majority of females 9-26 years of age for whom the HPV vaccine is recommended initiated the 3-shot series at these 2 HMOs; and, less than one-half of those who started eventually completed the series. In the U.S. national population, receipt of the HPV vaccine series is generally low, with 53.0% of 12-17 year olds initiating the series and 34.8% completing it [38].

A primary objective of our study was to determine if DHP enrollment, with potentially high levels of cost-sharing, might decrease receipt of the HPV vaccine series compared to HMP enrollment. Evidence of a direct association between initiation and completion of the HPV vaccine series and DHP vs. HMP enrollment was weak. In unadjusted comparisons, initiation of the HPV vaccine series was lower among DHP vs. HMP enrollees at KPCO (but not KPGA); however, this association lost statistical significance when primary care visit rates were taken into account. Similarly, completion of the HPV vaccine series was not associated with DHP vs. HMP enrollment at either site when primary care visit rates were included in the CPH models. These results are consistent with other studies showing weak or no associations of DHP vs. HMP enrollment with receipt of cancer screening services, which – like the HPV vaccine series – are typically exempt from patient cost-sharing [9-10].

A secondary objective of our study was to assess if DHP enrollment might indirectly affect initiation or completion of the HPV vaccine series through decreasing primary care visit rates which, unlike HPV vaccinations, require patient cost-sharing. DHP vs. HMP enrollment decreased primary care visit rates among age-eligible females; and, the decrease in primary care visits was greater in DHPs with high annual family deductibles. Independent of plan type, primary care visit rates were associated with HPV vaccine series initiation and completion – with higher rates increasing likelihood of initiation and completion. This result is consistent with literature indicating 1) frequency of primary care visits or provider contacts [17, 27-30] influences receipt of HPV vaccinations, and 2) primary care visits provide opportunities for health care providers to motivate compliance with preventive services recommendations [22-26].

Although these findings pertain to receipt of HPV vaccine among age eligible females in families who were enrolled in a self-pay KP DHP or HMP, similar results were found when comparing age-eligible females enrolled in a KP DHP vs. HMP obtained through employer-sponsored coverage (data available on request). Using the same research design which was used in the analysis reported here, there was no significant direct association between initiation or completion of the HPV vaccine series and DHP vs. HMP enrollment in employer sponsored plans – whether or not a choice of DHP or HMP was offered in a specific employer group.

Although these findings pertain to receipt of HPV vaccine among age eligible females in families who were enrolled in a self-pay KP DHP or HMP, similar results were found when comparing age-eligible females enrolled in a KP DHP vs. HMP obtained through employer-sponsored coverage (data available on request). Using the same analytic approach that we used for assessing the effect of DHP vs. HMP enrollment on initiation or completion of the HPV vaccine series in a propensity score matched sample of families in self-pay plans, there was no significant direct association between initiation or completion of the HPV vaccine series and DHP vs. HMP enrollment in employer sponsored plans – whether or not a choice of DHP or HMP was offered in a specific employer group.

In this study, we also found that initiation and completion of the HPV vaccine series were associated with patient age. The age association is consistent with other studies showing receipt is lowest in the youngest and oldest age eligible groups and highest among mid-teens [18, 28].

The current study has a number of strengths. The findings were based on a quasi-experimental design which used a 2-stage approach in 2 independently administered health plans with diverse demographic and SES characteristics. Comorbidities of all family members enrolled with KP, not just the patient, were used to adjust for health plan selection, since the aggregate of family health risks presumably factor into health plan choice. The range of DHPs and HMPs available to families and employer groups was broad; and the DHPs demonstrated a wide range of annual deductibles.

This study also has limitations. All families and individuals were enrolled through KP and, therefore, had comprehensive insurance coverage and access to health care. The computerized administrative data used in this study cannot measure some important patient or family factors influencing receipt of prevention services: misimpressions about plan benefits and covered services [20-21], attitudes that generally discourage receipt of any preventive vaccinations, or lack of awareness of the risks and benefits of the HPV vaccine series [29, 39-40]. Non-KP plan options available to patients and their families are not known. The measure of family composition may not have included the entire demographic family. An area-based SES measure, while concordant with family SES, does not capture family-level variability. Available data did not capture annual accrual of costs toward a deductible and, therefore, could not account for time-varying service prices within a calendar year. Some KP enrollees may obtain preventive health services outside the system, such as through community health clinics.

Previous studies have compared whether private vs. public health insurance coverage affects receipt of HPV vaccinations. The current study found enrollment in a deductible HMO plan compared to enrollment in a traditional HMO plan had little direct effect on initiation or completion of the HPV vaccine series, in samples of age-eligible females matched on propensity for health plan selection. Decreased primary care visits attributable to enrollment in a deductible HMO plan compared to a traditional HMO plan, however, may indirectly contribute to decreased rates of initiation and completion of the HPV vaccine series. While it is encouraging that enrollment in a deductible vs. traditional HMO plan does not appear to be a major factor in receipt of the HPV vaccine series, this finding should motivate attention

toward addressing other factors that might be affecting underuse of this important prevention service.

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Implications and Contributions

Concerns that potentially high cost-sharing required in deductible HMO plans might decrease receipt of an important prevention service – such as the HPV vaccine series – are not supported by this study's findings. More frequent contacts with primary care physicians are more influential for initiation and completion of the HPV vaccine series.

Table 1

Descriptive Statistics for the Unmatched Study Samples by Study Site and Plan Type for Families Insured Through a KP Self-Pay Plan.

	KPGA			KPCO		
	DHP	HMP	p- value	DHP	HMP	p- value
N of Patients	2842	834		455	2078	
Mean (Std. Dev.) Annualized Primary Care Visits in 12 Months Following Choice	5.5 (7.1)	7.2 (8.0)	<0.01	3.9 (4.7)	5.5 (7.2)	<0.01
Patient Age Group						
19-26	52.0%	54.6%	0.49	50.3%	47.6%	0.19
16-18	13.6	13.9		13.2	14.8	
13-15	13.9	13.1		15.0	16.2	
9-12	20.5	18.5		21.3	21.5	
Patient Comorbidities						
Asthma	6.7%	9.7%	<0.01	3.5%	6.5%	0.02
Any Other	2.5	7.8	<0.01	2.0	6.1	< 0.01
Patient is Subscriber	47.8%	49.2%	0.47	44.2%	47.6%	0.19
Subscriber Age Group						
50	11.3%	14.9%	0.01	14.2%	7.8%	< 0.01
45-49	15.7	14.0		16.7	14.6	
40-44	12.4	10.2		11.9	15.1	
30-39	9.1	7.1		8.4	12.6	
< 30	51.4	53.8		49.0	49.9	
Subscriber Gender						
Female	64.0%	64.5%	0.78	67.3%	73.5%	0.01
Male	36.0	35.5		32.7	26.6	
Family Composition						
Patient Only	43.0%	43.2%	0.15	40.4%	43.5%	0.10
Patient + 1 Child	8.3	10.7		5.7	4.8	
Patient + Children	11.2	9.1		22.0	21.6	
Patient + Spouse	3.4	3.1		8.4	1.5	
Patient, Spouse, + Child(ren)	34.1	33.9		28.6	28.6	
Comorbi- dities Among Family Members						
Diabetes	3.6%	6.6%	<0.01	2.0%	4.0%	0.03
Hypertension	13.9	22.3	<0.01	9.2	17.3	< 0.01
Hyperlipidemia	13.3	18.8	<0.01	5.1	6.4	0.28
Cancer	0.9	2.3	<0.01	0.0	0.8	0.06
Asthma/COPD	13.0	20.5	<0.01	4.0	7.9	< 0.01

	KPGA			KPCO		
	DHP	HMP	p-value	DHP	HMP	p-value
N of Patients	2842	834		455	2078	
	CAD/CHF/CVD	0.5	3.1	<0.01	0.0	0.4
	Peripheral Vascular Disease	0.2	0.8	0.01	0.0	0.99
	Chronic Kidney Disease	0.5	2.3	<0.01	0.0	N/A
Study Site Neighbor- hood SES	Low	11.9%	13.0%	0.85	11.9%	0.78
	Lower Middle	16.8	16.1		18.3	20.3
	Upper Middle	25.5	25.2		29.9	28.2
	High	45.8	45.7		39.9	39.6
Annual Family Deductible	\$5,000	--	73.6%	--	73.3%	--
	\$2,500 - \$4,999	--	13.6	--	23.3	
	< \$2,500	--	12.8			

Notes:

- 1) KPGA=Kaiser Permanente Georgia, KPCO=Kaiser Permanente Colorado, DHP=deductible health plan, HMP = traditional health maintenance plan, COPD = chronic obstructive pulmonary disease, CAD = coronary artery disease, CHF = congestive heart failure, CVD = cerebrovascular disease, SES=socioeconomic status
- 2) KPCO reported no Stage 3-5 CKD cases in this study population, hence N/A is indicated in the p-value cell comparing DHP vs. HMP.
- 3) Percent by annual family deductible is a percent based on number of DHP enrollees only. Traditional HMPs have no annual family deductible.

Table 2

Initiation of the HPV Vaccination Series in the Propensity Score Matched Samples: Percent Who Initiate the Series and Their Median Time to Initiation.

Study Site	Plan Type		Initiated		Censored	
	Selected	N	Percent	Median [IQ] Time to Initiate	N	Median [IQ] Time
KPGA	DHP	794	176	22.2	618	14 [7, 27]
	HMP	794	194	24.4	600	16.5 [7, 30]
	p-value	--	--	0.72	--	<0.01
KPCO	DHP	405	126	31.1	279	8 [4, 18]
	HMP	405	187	46.2	218	13 [6, 31]
	p-value	--	--	< 0.01	--	< 0.01

Notes:

- 1) KPGA=Kaiser Permanente Georgia, KPCO=Kaiser Permanente Colorado, DHP=deductible health plan, HMP=traditional HMO plan, IQ=interquartile range.
- 2) Difference between DHP vs. HMP in percent initiated was tested with a χ^2 -test.
- 3) Difference between DHP and HMP in median time to initiate or median censored time were tested with a log-rank test.
- 4) Censoring occurred if an age-eligible female at the 2007 eligibility month: had not initiated or completed the series by December 31, 2009, reached the age of 27 prior to December 31, 2009, or disenrolled from the health plan prior to December 31, 2009.

Table 3

Completion of the HPV Vaccination Series in the Propensity Score Matched Samples: Percent Who Complete the Series and Their Median Time to Completion.

Study Site	Plan Type		Completed			Censored	
	Selected	N	Percent	Median [IQ] Time to Complete	N	Median [IQ] Time	
KPGA	DHP	794	12.3	16 [11, 23]	696	16 [7, 29]	
	HMP	794	14.4	17 [11, 24]	680	18 [8, 32]	
	p-value	--	0.24	0.66	--	< 0.01	
KPCO	DHP	405	9.1	16 [10, 21]	368	9 [4.5, 27]	
	HMP	405	19.3	17 [13, 24]	327	20 [8, 36]	
	p-value	--	< 0.01	0.69	--	< 0.01	

Notes:

- 1) KPGA=Kaiser Permanente Georgia, KPCO=Kaiser Permanente Colorado, DHP=deductible health plan, HMP=traditional HMO plan, IQ=interquartile range.
- 2) Difference between DHP vs. HMP in percent completed was tested with a χ^2 -test.
- 3) Difference between DHP and HMP in median time to complete or median censored time were tested with a log-rank test.
- 4) Censoring occurred if an age-eligible female at the 2007 eligibility month: had not initiated or completed the series by December 31, 2009, reached the age of 27 prior to December 31, 2009, or disenrolled from the health plan prior to December 31, 2009.

Table 4

Adjusted Primary Care Visit Rates Among 9-26 Year Old Females Models in the Propensity Score Matched Samples.

Study Site	Model Specification	Independent Variable (Plan Type)	Difference in Mean Annual Primary Care Visits for the Independent Variable vs. Intercept			
			Adjusted Visit Rate	Lower 95% CI	Upper 95% CI	p-value
KPGA	Model 1	DHP	-1.59	-2.32	-0.86	<0.01
	Model 2	\$5,000 annual deductible DHP	-1.83	-2.64	-1.03	<0.01
		\$2,500-\$4,999 annual deductible DHP	-1.09	-2.56	0.37	0.14
		<\$2,500 annual deductible DHP	-0.85	-2.33	0.62	0.26
KPCO	Model 1	DHP	-1.68	-2.45	-0.91	<0.01
	Model 2	\$5,000 annual deductible DHP	-1.77	-2.60	-0.94	<0.01
		\$2,500-\$4,999 annual deductible DHP	-1.36	-2.61	-0.11	0.03
		<\$2,500 annual deductible DHP				

Notes:

- :1) KPGA=Kaiser Permanente Georgia, KPCO=Kaiser Permanente Colorado, DHP=deductible health plan.
- 2) For plan type, the effect estimate is for DHP (deductible health plan) and the reference is HMP (health maintenance plan).
- 3) In Models 1 and 2, the reference is HMP (traditional health maintenance plan).
- 4) Linear regression models adjust for patient age, patient comorbidities, and neighborhood SES (socioeconomic status).
- 5) KPCO had no self-pay DHPs with an annual family deductible <\$2,500 in 2007. Thus, these 2 deductible levels are combined for analysis.

Table 5

Hazard Ratios for Time to Initiation or Completion of the HPV Vaccine Series in the Propensity Score Matched Samples.

Study Site	Dependent Variable	Model Specificati on	Independent Variable(s)	Hazard Ratio (HR) for the Independent variable			
				Adjusted HR	Lower 95% CI	Upper 95% CI	P-value
KPGA	Time to Initiation	Model 1	Plan Type: DHP	0.967	0.788	1.188	0.75
		Model 2	Plan Type: DHP	1.046	0.850	1.287	0.67
	Time to Completion		Annualized Visit Rate	1.052	1.038	1.067	<0.01
		Model 1	Plan Type: DHP	0.925	0.704	1.214	0.57
KPCO	Time to Initiation	Model 2	Plan Type: DHP	1.005	0.763	1.323	0.97
			Annualized Visit Rate	1.062	1.043	1.081	<0.01
		Model 1	Plan Type: DHP	0.789	0.629	0.989	0.04
		Model 2	Plan Type: DHP	0.831	0.662	1.044	0.11
	Time to Completion		Annualized Visit Rate	1.051	1.033	1.071	<0.01
		Model 1	Plan Type: DHP	0.715	0.483	1.060	0.09
		Model 2	Plan Type: DHP	0.730	0.492	1.082	0.12
			Annualized Visit Rate	1.048	1.008	1.090	0.02

Notes:

- 1) KPGA=Kaiser Permanente Georgia, KPCO=Kaiser Permanente Colorado, DHP=deductible health plan, HR=hazard ratio, CI=confidence interval.
- 2) For plan type, the reference is HMP (traditional health maintenance plan).
- 3) Cox proportional hazards models adjust for patient age, patient comorbidities, and neighborhood SES (socioeconomic status).
- 4) KPCO had no self-pay DHPs with an annual family deductible <\$2,500 in 2007. Thus, these 2 deductible levels are combined for analysis.