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Young Adult HPV and Influenza Vaccine Coverage: A Comparison across College Enrollment Status

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By

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B.S., University of Wisconsin – Madison, 2016

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Abstract

Young Adult HPV and Influenza Vaccine Coverage: A Comparison across College Enrollment Status

By Kara Mathewson

Young adulthood is a crucial time for receiving preventive care services, including catch-up human papillomavirus (HPV) vaccinations and annual influenza vaccinations. Of the 30 million adults aged 18-24 in the United States, approximately 40% are enrolled in post-secondary education. These different sub-groups, college-enrolled and non-enrolled young adults, have varying reasons for receiving and not receiving preventive care services like vaccinations, with access being an important factor. To better understand preventive care use among these groups, we investigated perceptions and behaviors of preventive health care of college enrolled and non-enrolled young adults. We surveyed 417 young adults aged 18-26 over a one-month period by recruiting participants through Amazon's Mechanical Turk (MTurk) platform. Overall, 49% of participants reported receiving at least one dose of HPV vaccine and 57% reported receiving at least one influenza vaccine over the past three years. Vaccine coverage estimates did not differ between college-enrolled and non-enrolled respondents. The strongest predictors of vaccine receipt included having a provider recommendation for the vaccine as well as having a primary care provider. Additional research is needed to develop interventions to improve vaccination coverage among young adults; both currently enrolled and not enrolled in college.

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Literature Review

Young Adulthood

The transition from adolescence to adulthood is marked by a greater level of independence and a new role in health-related decision-making.[1] Health related behaviors that are learned during this crucial developmental period are part of the foundation for lifelong health trajectories.[1] This is an important time period for both preventive care measures recommended for this age group - including catch-up vaccinations, sexually transmitted disease (STD) testing, and cervical cancer screening for women - as well as forming lifelong behaviors and attitudes regarding preventive care.[2] During childhood and early adolescence, parents often make decisions regarding their child's preventive care, but as adolescents transition into adulthood, there is increased personal responsibility for making these decisions. Little is known about how this transition affects utilization of preventive care. Having a better understanding of the demographic breakdown and behaviors of young adults will be crucial for the development and implementation of preventive health interventions to promote lifelong health behaviors and improve young adult health.

Preventive Health Care Utilization Among Young Adults

Despite the importance of preventive care for young adults aged 18-26, preventive care use among this group is low. Fewer than 65% of young adults aged 18-25 have been tested for HIV,[3] despite the routine recommendation for HIV screening in all healthcare settings for adults and adolescents aged 15-65.[4,5] General STD screening rates are even lower. According to the California Health Interview Surveys, 42% of young adults aged 18-26 reported being screened for any STDs.[6] For women aged 15-24 who have had sex with an opposite sex partner in the past year, only 38% were tested for the most common STD in the US – chlamydia.[7] STD testing is

not the only preventive care service that is underutilized by young adults. This group also reports low coverage of recommended vaccinations, including the HPV and influenza vaccines. Lau et al. found that only 17% of young adults aged 18-26 reported receiving a flu shot.[6] The 2013 National Health Interview Survey estimates this number to be slightly higher, where 25% of those aged 18-24 reported receiving the flu shot.[7] Flu vaccine coverage among this group remains low, especially in comparison with the tetanus vaccine. Between 63-74% of those aged 18-24 reported having received a tetanus vaccination in the past 10 years.[7] The HPV vaccine is also recommended for young adults through age 26. Coverage with this vaccine among this group is also low. In 2015, only 41.6% of females and 10.1% of males aged 19-26 reported having received at least one dose of the HPV vaccine.[8]

Not all preventive care services are underutilized by young adults. About 75% of women aged 20-24 reported receiving a Papanicolaou (Pap) test in the past 3 years.[7] However, many services, including vaccinations and STD screening tests, are more likely to be used by some young adults than others. For example, females are more likely to receive preventive care than males.[6] It is imperative to examine the different subpopulations within this age group to inform future interventions targeted at young adults.

In addition to low utilization of preventive care services, young adults are generally worse off in terms of health status and behavior, risk perceptions, and access to care compared to adolescents and adults aged 26-34.[3] Young adults, aged 19-25 years, have the second highest uninsured rates in the U.S., at 14.5%.[9] In 2012, young adults were the most likely age group to report no healthcare visits within the past year.[3] Furthermore, this group exhibits more risky behaviors, including having high rates of alcohol and marijuana use.[3] Of those aged 18-25 years, 60%

report using alcohol and 38% reported binge drinking in the past month.[10] Additionally, daily marijuana use is for this age group is 8%, the highest it has been over the past 30 years.[11]

College Enrollment Status

Young adults aged 18-26 are not a homogenous group. One of the major splits within this group is post-secondary education enrollment status. Young adults aged 18-26 make up about 12.5% of the US population.[12] Of the estimated 30.7 million adults aged 18-24,[12] in 2013 approximately 40% were enrolled in post-secondary education.[13] This leaves approximately 18.4 million young adults who are not enrolled in post-secondary education. These different sub-groups have implications for preventive care, especially in terms of access. College enrolled young adults may have varied access depending on if their college has a student health center. In addition to this resource, college wellness programs may offer more education about health and disease prevention than non-college enrolled young adults may receive. Insurance status is also an important factor for preventive care access in both groups. The Affordable Care Act's (ACA) expanded coverage for young adults to be able to remain on their parent's health insurance until the age of 26 has played a role in how these groups differ in accessing and utilizing care. Younger, college-enrolled students are more likely to be covered under their parent's insurance and benefit the most from this ACA policy due to more stable insurance coverage and better access to care.[14] However, living away from home may introduce logistical barriers to receiving preventive care, such as lacking a primary care physician while at school and potential health insurance coverage issues if they are covered through a parent's insurance. Young adults who remain on their parent's health insurance and are living away from home may face challenges in finding in-network providers. In 2011, 44% of health insurance plans had a deductible of $1,000 or more for out-of-network services.[15] With high-deductibles, enrollees are more likely to skip or

delay medical care.[16] Only having access to out-of-network providers can become a barrier to receiving care for young adults who are enrolled through their parent's insurance.

Preventive Care Utilization: College Enrolled Young Adults

College students are an important subset of this young adult population, whom also show low rates of preventive care use. In 2016, only 52% of college students reported ever having received the HPV vaccine and only 23% reported having ever been tested for HIV.[17] In a study looking at a large, public New York State university, only 28% of students reported receiving that season's flu vaccine.[18] According to data from the College Health Surveillance Network, about 16% of enrolled students at 4-year universities are seen at student health services for prevention-related clinical services.[19] Despite these low numbers, a recent study looking at healthcare seeking behaviors of young adults showed that students have more access to STD testing than non-students.[20] Access to care likely plays a role in preventive care utilization by these different groups of young adults.

Young Adult Sub-Group Differences

Due to the varied lifestyles of these two groups, those enrolled and those not enrolled in post-secondary education, it is not appropriate to consider young adults as a homogenous group. In order to improve the health of young adults, these differences need to be considered when developing and implementing preventive health interventions. This study adds a unique perspective to address the differences among the young adult population by assessing the behaviors and perspectives among these diverse groups.

Manuscript

Contribution of the Student

My contribution to this project began in August 2017 after Dr. Bednarczyk and I put together a research plan for my thesis. I contributed in survey development, survey administration, data collection, analysis of results, writing of the manuscript, and table development.

Intended Journal for Submission

American Journal of Public Health

Introduction

The transition from adolescence to young adulthood is marked by a greater level of independence and a new role in health-related decision-making.[1] This is an important time period for preventive care measures recommended for this age group – such as vaccinations – as well as forming lifelong behaviors and attitudes regarding preventive care. Young adults aged 18-26 make up about 12.5% of the US population,[12] and are generally worse off in terms of health status and behavior, risk perceptions, and access to care compared to adolescents and adults aged 26-34.[3] Despite the importance of preventive care among young adults, preventive service use is low, including vaccine coverage.

Vaccine coverage for young adults aged 18-26 is low. The 2013 National Health Interview Survey found that only 25% of those aged 18-24 reported receiving the flu shot.[7] Flu vaccine coverage among this group remains low, especially in comparison with the tetanus vaccine. Between 63-74% of those aged 18-24 reported having received a tetanus vaccination in the past 10 years.[7] HPV vaccine is also recommended for young adults through age 26, however, in 2015, only 41.6% of females and 10.1% of males aged 19-26 reported having received at least one dose of HPV vaccine.[8]

Young adults aged 18-26 are not a homogenous group. One of the major splits within this group is post-secondary education enrollment status. In 2013, approximately 40% of young adults aged 18-24 were enrolled in post-secondary education.[13] These different sub-groups have implications for preventive care including vaccinations, especially in terms of access. College enrolled young adults may have varied access depending on if their college has a student health center, however there has not been a large-scale analysis comparing vaccination coverage by college enrolled and non-enrolled young adults. To address this, we conducted a survey among young adults aged 18-

26 living in the United States, with a primary goal to assess differences in HPV an influenza vaccine uptake by current college enrollment status.

Methods

Study Sample

Between November 2017 and December 2017, we conducted a cross-sectional survey of young adults, aged 18-26, on preventive health care perceptions and behaviors. Emory University's institutional review board approved the protocols for this study.

Participants were recruited from Amazon's Mechanical Turk (MTurk), an online platform where individuals are paid to complete online surveys.[21] Eligible participants were young adults aged 18-26 who resided in the United States and had a Human Intelligence Task (HIT) approval rate greater than or equal to 95% for all MTurk work. An MTurk worker's HIT approval rate indexes the percentage of tasks that are approved by requesters relative to the number of tasks completed by the worker.

Once MTurk workers accepted the task on the MTurk website, they were provided a link to the survey on Survey Monkey where they were asked two screening questions (country of residence and age) to assess eligibility. If the worker was eligible to continue they were directed to a consent page that informed them of their rights as a participant in the study and provided them with contact information if they had questions or concerns about the study. Participants who consented to participate indicated consent electronically, and record of consent provision was recorded. We compensated all individuals who completed the two screener questions $0.05 and eligible participants who also completed the survey received an additional bonus of $1.25.

Survey

An online, anonymous survey was developed using Survey Monkey (SurveyMonkey, Inc.). There were 66 questions on the survey that assessed participants' preventive health care perceptions and behaviors, including questions to assess vaccine confidence. The survey consisted of several sections: Health Care Utilization,[22] Preventive Care, Vaccine Confidence Measures (including items from the Vaccine Confidence Index,[23] Parent Attitudes about Childhood Vaccines survey,[24] and the Vaccine Confidence Scale[25]), Risk Perceptions, Present Bias,[26] Information Seeking and Social Media.[22] The survey contained multiple choice questions, some of which were multiple-part questions.

The primary exposure of interest for this analysis was enrollment in post-secondary education. Participants indicated if they were currently enrolled in post-secondary education. If they indicated current enrollment in post-secondary education, they were directed to a question about type of school (i.e. 2 year college, vocational training, 4 year college/university, graduate school).

The main outcome measures were self-reported HPV and influenza vaccination status. For HPV vaccine coverage, the outcome of interest was initiation of the HPV vaccine series, not series completion. Self-reported coverage of the HPV vaccine was assessed without distinction between the bivalent, quadrivalent, and 9-valent vaccines. If participants reported that they received any dose of the HPV vaccine, they were asked follow-up questions regarding age of series initiation and number of doses they had received. Self-reported influenza vaccine coverage over the past three years was also collected. Participants were asked to report how many times they had received an influenza vaccine during the past three years. For the purpose of this analysis we looked at influenza vaccine coverage as a dichotomous variable, categorized into

those who received at least one dose of influenza vaccine in the past three years and those who have received no doses of influenza vaccine in the past three years.

Statistical Analysis

Data were downloaded into Microsoft Excel and imported into SAS v9.4 (The SAS Institute, Cary NC) for data management and analysis. Descriptive statistics were computed to assess distributions and frequencies. HPV and influenza vaccine coverage by college enrollment status and demographic variables were looked at using prevalence ratios (PR) with 95% confidence intervals. Coverage of HPV vaccine and influenza vaccine were also modeled using multivariate analysis to identify contributing demographic variables while controlling for other factors. An initial list of variables that were hypothesized to be associated with vaccine receipt were modeled using a backward elimination strategy. A modified Poisson approach was used to estimate prevalence ratios for these analyses.[27,28]

Results

Study Sample

From November to December, 2017, 2,000 MTurk workers followed our Survey Monkey link and completed the first screener question. 1,494 were ineligible for the study, and of the remaining 506 eligible workers, 82% (n=417) completed at least half of the survey questionnaire. There were 417 individuals who were eligible to take the survey, consented to participate, and completed at least half of the survey. These 417 participants were the final sample included in the analysis. Of our final sample, 49% were enrolled in post-secondary education (n=205). Those enrolled in post-secondary education were primarily enrolled in 4-year colleges and universities (53%) and 2-year colleges (25%). The remainder indicated that they were enrolled in graduate

school (17%) and technical or vocational training (5%). Approximately 70% of the respondents were female (n=290). Respondents were predominantly white and non-Hispanic and the mean age for respondents was 23 years old (Table 1).

HPV Vaccine Coverage

Of the 417 enrolled participants, 49% of participants reported ever receiving at least one dose of HPV vaccine. HPV vaccine coverage was slightly higher among college-enrolled participants (52%) than non-enrolled participants (46%). A higher percent of females reported receiving at least one dose of HPV vaccine (59%) than males (25%). HPV vaccine receipt did not differ greatly between participants who were enrolled in post-secondary education and those who were not (aPR 1.00, 95% CI 0.87, 1.15) (Table 2).

Influenza Vaccine Coverage

Out of the 417 participants, 57% reported that they had received at least one dose of influenza vaccine in the past three years. College enrolled participants (62%) had higher coverage for receipt of at least one influenza vaccine than non-enrolled participants (53%), however this difference was not significant (aPR 1.15, 95% CI 0.98, 1.35) (Table 3). Of those who received at least one influenza vaccine in the past three years, 39% reported receiving an influenza vaccine three times, 29% reported receiving it two times, and 32% reported only receiving the vaccine once.

Provider Impact

Participants who received a provider recommendation for HPV vaccine were more likely to receive at least one dose of HPV vaccine, when adjusting for other factors (aPR 8.57, 95% 5.44, 13.52) (Table 2). A similar, though weaker association was documented for the influenza vaccine

(aPR 2.99, 95% CI 1.98, 4.54) (Table 3). In this analysis, provider recommendations for both the influenza and HPV vaccines were the only significant predictor for receiving either vaccine. In addition to having a provider recommendation, participants who indicated that they had a primary care doctor were more likely to have received the influenza vaccine in the past three years (aPR 1.32, 95% CI 1.06, 1.63) (Table 3).

Discussion

This study identified low coverage with HPV vaccine (49%) and influenza vaccine (57%) among young adults aged 18-26 in the United States. These results did not indicate a significant difference of HPV or influenza vaccine coverage for young adults enrolled in post-secondary education compared to those not enrolled.

Although vaccine coverage with HPV and influenza vaccines did not significantly differ between college enrolled young adults and non-enrolled young adults, these low coverage rates demonstrate the need to improve vaccine strategies for this group. HPV is easily transmitted through skin-to-skin and sexual contact, which is a common mode of transmission among young adults due to increased sexual activity in this population.[29] For example, the number of recent casual sex partners increases as adolescents transition into young adulthood.[30] Lyons et al. (2015) found that 40% of young adults age 22 reported having at least one recent casual sex partner.[30] Despite the common perception that a college environment is more conducive to casual sex, one study found that young adults enrolled in four-year post-secondary education reported fewer casual sex partners compared to young adults who were not currently enrolled in school.[31] With about half of the 14 million new HPV infections that occur in the U.S. each year occurring

in people aged 15-24 years,[32] there is a need to improve HPV vaccine uptake and catch-up vaccination in emerging young adults.

Influenza also has a significant effect on this population. In more recent seasons, influenza has had a more severe impact on young adults.[33] During the most recent influenza season (2017-2018) about 22% of influenza-positive patients were ages 5-24 years.[34] Young adults, college-enrolled and non-enrolled, may have overlapping reasons for not receiving the influenza vaccine. An analysis of the National Flu Survey data from 2011-2012 found that the most common reasons cited for not receiving influenza vaccine were, "unlikely to get very sick from the flu" and "never get the flu."[35] In a study looking at influenza uptake at a large public university, the most common reasons for not receiving influenza vaccine were, "too lazy to bother getting it" and "don't need it because I'm healthy."[18] These studies confirm that adults, enrolled in college or not, may not understand the risk of transmission of influenza even when someone is asymptomatic. Furthermore, young adults in college settings may be at higher risk to transmit influenza due to close contact between students. This further highlights the need to improve coverage of influenza vaccine among this group.

The results from this study also confirm the existing gap in HPV coverage between males and females. In a 2015 study at a public university in California, HPV vaccine coverage among college males aged 18-26 was only 12%.[36] Despite improved coverage over the past few years, this has been a slow increase. This disparity between males and females points to the need for interventions that target the differing needs of these sub-groups, including differences in primary care reproductive visits. Furthermore, interventions to close the HPV vaccine coverage gap between males and females should consider framing messages towards males in order to reduce the burden of HPV cancers and diseases. Dillard and Spear (2010) and Ratanasiripoing (2015)

found that HPV and HPV vaccine knowledge among college students is lacking.[36,37] This provides evidence that future interventions must also address knowledge gaps surrounding HPV infection and vaccination.

In this study, we found that provider recommendation was associated with receipt of vaccinations. This is consistent with previous findings that demonstrate that a provider recommendation is strongly associated with preventive care service receipt, including vaccination.[38-41] However, strong, consistent recommendations for vaccinations are not always given, especially for HPV vaccine.[42,43]

Both having a primary care doctor and a provider recommendation were associated with influenza vaccine receipt. This study did not assess differences in access to primary care providers between college enrolled and non-enrolled young adults, however avenues to care are an important consideration for improving vaccine coverage in these populations. The Affordable Care Act's (ACA) expanded coverage has increased private insurance coverage for young adults with coverage gains being larger among nonstudents than students.[44] However, college-enrolled students are more likely to be covered under their parent's insurance and benefit the most from this policy.[14] Differences in insurance coverage impact young adults' access to care. Additionally, college-enrolled and non-enrolled young adults may have different health care facilities available to them. College students may have access to student health centers, but the services offered by these facilities vary from school to school. On the other hand, college students covered by their parent's insurance may face logistical barriers to receiving care if they attend school away from home. There is a need to develop tailored messages, designed to address differences in health care access, to promote vaccination among young adults.

A limitation of this study includes the relatively small sample due to time restrictions of the study. In addition to this, the sample was predominantly female (70%) and therefore the small sample of males may impact the power of these analyses. Self-reported data on preventive health care utilization, including vaccine history, is another limitation. Self-reported vaccination status is subject to recall bias.[45] Furthermore, this analysis did not explain the reasons for receipt or nonreceipt of vaccinations. To create intervention strategies to increase vaccine uptake in these populations, future studies must understand the reasons for vaccine nonreceipt.

This study did not assess the difference of college-enrolled vaccination coverage based on characteristics of colleges and universities, but these characteristics are likely an important consideration for evaluating access to care for this population and should be further investigated. For example, it has been shown that private schools have higher rates of health care utilization than public schools.[46] To improve vaccine coverage and other preventive care service utilization among young adults, we need to gain a better understanding about how and where these populations access primary care and preventive services.

Not assessing temporality between recommendation and receipt of vaccination is another important limitation to address. 60% of respondents reported that they had received a recommendation for HPV vaccine and nearly 80% received a recommendation for influenza vaccine. Most young adults in our study received recommendations for these vaccines, however uptake remains low in this population. A frequently cited reason for not intending to receive HPV vaccination is the concern about vaccine costs and insurance coverage.[47,48] Providers must address access options and affordability when recommending preventive services to young adults, especially for HPV vaccination.

In contrast, concerns about cost have not been as commonly cited in regard to influenza vaccination. Findings from a study at a large public university showed that almost one third of students surveyed said they were "too lazy to bother getting it [influenza vaccine]."[18] To address this barrier, influenza vaccination campaigns on college campuses need to be more easily accessible. Schools should consider vaccinating students in common gathering spaces, where large numbers of students visit daily. During a 2016 outbreak of meningitis at a large Wisconsin university, free meningitis vaccines were given at an on-campus recreational facility and about 70% of undergraduates were vaccinated over a two-week period.[49,50] This demonstrates the potential success this type of strategy could have for influenza vaccine delivery for college-enrolled young adults.

Overall, HPV and influenza vaccine coverage among young adults 18-26 is low. To better understand preventive care use among these groups, we must investigate avenues to care for student and non-student young adults. Future interventions should focus on tailored education to address influenza and HPV perceptions, including issues of perceived risk, cost, availability, and accessibility.

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Table 1. Demographic and preventive care characteristic comparisons of young adults aged 18-26 recruited from Amazon Mechanical Turk, 2017.

Characteristic	Overall	Enrolled in College, N (%)	Not Enrolled in College, N (%)	χ2 p-value
	417 (100%)	205 (49.16%)	212 (50.84%)	
HPV Vaccine (≥ 1 dose), n (%)				0.1719
Yes	203 (48.8%)	107 (52.2%)	96 (45.5%)	
No	213 (51.2%)	98 (47.8%)	115 (54.5%)	
Missing	1	0	1	
Flu Shot (≥ 1 past 3 years), n (%)				0.0543
Yes	232 (57.28%)	123 (62.12%)	109 (52.66%)	
No	173 (42.72%)	75 (37.88%)	98 (47.34%)	
Missing	12	7	5	
Sex, n (%)				0.3687
Male	126 (30.29%)	66 (32.35%)	60 (28.3%)	
Female	290 (69.71%)	138 (67.65%)	152 (71.7%)	
Missing	1	1	0	
Hispanic, n (%)				0.414
Yes	67 (16.07%)	36 (17.56%)	31 (14.62%)	
No	350 (83.93%)	169 (82.44%)	181 (85.38%)	
Race, n (%)*				0.2019
White	280 (67.15%)	128 (62.44%)	152 (71.70%)	
Black or African American	46 (11.03%)	26 (12.68%)	20 (9.43%)	
Asian	33 (7.91%)	21 (10.24%)	12 (5.66%)	
Multiple Races (selected more than 1 race)	34 (8.15%)	16 (7.80%)	18 (8.49%)	
Other	24 (5.76%)	14 (6.83%)	10 (4.72%)	
Education, n (%)				<.0001
Less than High School Graduate/GED	3 (0.72%)	1 (0.49%)	2 (0.95%)	
High school graduate/GED	58 (13.98%)	16 (7.84%)	42 (19.91%)	
Some college or Associates Degree	204 (49.16%)	133 (65.2%)	71 (33.65%)	
Bachelor's Degree	126 (30.36%)	42 (20.59%)	84 (39.81%)	
Graduate Degree	24 (5.78%)	12 (5.88%)	12 (5.69%)	
Missing	2	1	1	
Age, n (%)				<.0001
18-22	156 (37.41%)	109 (53.17%)	47 (22.17%)	
Mean (Standard Deviation)	20.68 (1.3)	20.49 (1.30)	21.13 (1.21)	
23-26	261 (62.59%)	96 (46.83%)	165 (77.83%)	
Mean (Standard Deviation)	24.64 (1.10)	24.5 (1.11)	24.73 (1.08)	
Primary Care Doctor, n (%)				0.4004
Yes	291 (69.78%)	147 (71.71%)	144 (67.92%)	
No	126 (30.22%)	58 (28.29%)	68 (32.08%)	

Table 2. Bivariate and multivariate predictors of human papillomavirus vaccine receipt (at least one dose) among young adults in the United States.

Characteristics	Overall (N,%)	Received ≥ 1 dose of HPV Vaccine, N (%)	Bivariate Analysis PR (95% CI)[a]	Multivariate Analysis-Fully adjusted model aPR (95% CI)[a]	Multivariate Analysis-Reduced model aPR (95% CI)[a]
	n=417	203 (48.8%)			
College Enrollment					
Enrolled	205 (49.16%)	107 (52.2%)	1.15 (0.94, 1.40)	0.99 (0.85, 1.14)	1.00 (0.87, 1.15)
Not Enrolled	212 (50.84%)	96 (45.5%)	Referent	Referent	Referent
Sex, n (%)					
Male	126 (30.29%)	32 (25.40%)	Referent	Referent	-
Female	290 (69.71%)	170 (58.82%)	2.32 (1.69, 3,17)	1.30 (1.03, 1.66)	-
Race, n (%)					
White	280 (67.15%)	136 (48.75%)	Referent	Referent	-
Black or African American	46 (11.03%)	26 (56.52%)	1.16 (0.88, 1.54)	1.13 (0.87, 1.47)	-
Asian	33 (7.91%)	15 (45.45%)	0.93 (0.63, 1.38)	1.25 (1.06, 1.49)	-
Multiple Races (selected more than 1 race)	34 (8.15%)	13 (38.24%)	0.78 (0.50, 1.22)	0.85 (0.60, 1.19)	-
Other	24 (5.76%)	13 (54.17%)	1.17 (0.79, 1.73)	1.41 (1.03, 1.92)	-
Age					
18-22	156 (37.41%)	75 (48.08%)	0.98 (0.80, 1.20)	1.02 (0.88, 1.18)	-
23-26	261 (62.59%)	128 (49.23%)	Referent	Referent	-
Primary Care Doctor					
Yes	291 (69.78%)	154 (53.10%)	1.37 (1.07, 1.74)	1.02 (0.85, 1.22)	-
No	126 (30.22%)	49 (38.89%)	Referent	Referent	-
Provider Recommendation for HPV Vaccine					
Yes	231 (55.93%)	185 (80.09%)	8.57 (5.43, 13.54)	8.05 (5.05, 12.82)	8.57 (5.44, 13.52)
No	182 (44.07%)	17 (9.34%)	Referent	Referent	Referent

[a] Prevalence ratio (95% confidence interval).

Table 3. Bivariate and multivariate predictors of influenza vaccine receipt (at least one dose in the past three years) among young adults in the United States.

Characteristics	Overall (N,%)	Received ≥ 1 Flu Shot over past 3 years, N (%)	Bivariate Analysis PR (95% CI)[a]	Multivariate Analysis-Fully adjusted model aPR (95% CI)[a]	Multivariate Analysis-Reduced model aPR (95% CI)[a]
	n=417	232 (57.28%)			
College Enrollment					
Enrolled	205 (49.16%)	123 (62.12%)	1.18 (0.99, 1.40)	1.14 (0.97, 1.34)	1.15 (0.98, 1.35)
Not Enrolled	212 (50.84%)	109 (52.66%)	Referent	Referent	Referent
Sex, n (%)					
Male	126 (30.29%)	69 (56.10%)	Referent	Referent	-
Female	290 (69.71%)	162 (57.65%)	1.03 (0.85, 1.24)	0.96 (0.81, 1.14)	-
Race, n (%)					
White	280 (67.15%)	161 (58.76%)	Referent	Referent	-
Black or African American	46 (11.03%)	21 (50.0%)	0.85 (0.62, 1.17)	0.89 (0.65, 1.22)	-
Asian	33 (7.91%)	22 (70.97%)	1.21 (0.94, 1.54)	1.23 (0.99, 1.53)	-
Multiple Races (selected more than 1 race)	34 (8.15%)	14 (41.18%)	0.70 (0.46, 1.06)	0.76 (0.52, 1.13)	-
Other	24 (5.76%)	14 (58.33%)	0.99 (0.70, 1.41)	1.11 (0.79, 1.54)	-
Age					
18-22	156 (37.41%)	83 (55.33%)	0.95 (0.79, 1.13)	0.95 (0.80, 1.12)	-
23-26	261 (62.59%)	149 (58.43%)	Referent	Referent	-
Primary Care Doctor					
Yes	291 (69.78%)	182 (64.08%)	1.55 (1.23, 1.95)	1.32 (1.06, 1.63)	-
No	126 (30.22%)	50 (41.32%)	Referent	Referent	-
Provider Recommendation for Flu Shot					
Yes	326 (78.74%)	213 (66.15%)	3.01 (1.99, 4.57)	2.76 (1.82, 4.17)	2.99 (1.98, 4.54)
No	88 (21.26%)	18 (21.95%)	Referent	Referent	Referent

[a] Prevalence ratio (95% confidence interval).

Appendix A

Emory Institutional Review Board Approval Letter

TO: Robert Bednarczyk, PhD
Principal Investigator
*SPH: Global Health

DATE: November 7, 2017

RE: **Expedited Approval**
IRB00099607
Preventive Health Care Behaviors and Attitudes among Young Adults: A Comparison across College Enrollment Status

Thank you for submitting a new application for this protocol. This research is eligible for expedited review under 45 CFR.46.110 and/or 21 CFR 56.110 because it poses minimal risk and fits regulatory category F7 as set forth in the Federal Register. The Emory IRB reviewed it by expedited process on 11/7/2017 and granted approval effective from **11/7/2017** through **11/6/2018**. Thereafter, continuation of human subjects research activities requires the submission of a renewal application, which must be reviewed and approved by the IRB prior to the expiration date noted above.

The Emory IRB hereby grants a waiver of documentation of informed consent.

The following documents are approved for use or otherwise acknowledged:

- Study Protocol, version date 1-Oct-17
- Young Adult Health Care Seeking Behaviors and Attitudes Survey, undated
- Consent script, undated

Any reportable events (e.g., unanticipated problems involving risk to subjects or others, noncompliance, breaches of confidentiality, HIPAA violations, protocol deviations) must be reported to the IRB according to our Policies & Procedures at www.irb.emory.edu, immediately, promptly, or periodically. Be sure to check the reporting guidance and contact us if you have questions. Terms and conditions of sponsors, if any, also apply to reporting.

Before implementing any change to this protocol (including but not limited to sample size, informed consent, study design, you must submit an amendment request and secure IRB approval.

In future correspondence about this matter, please refer to the IRB file ID, name of the Principal Investigator, and study title. Thank you.

Sincerely,

Samuel Roberts
Senior Research Protocol Analyst
This letter has been digitally signed

CC: Mathewson Kara *SPH: Global Health

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