

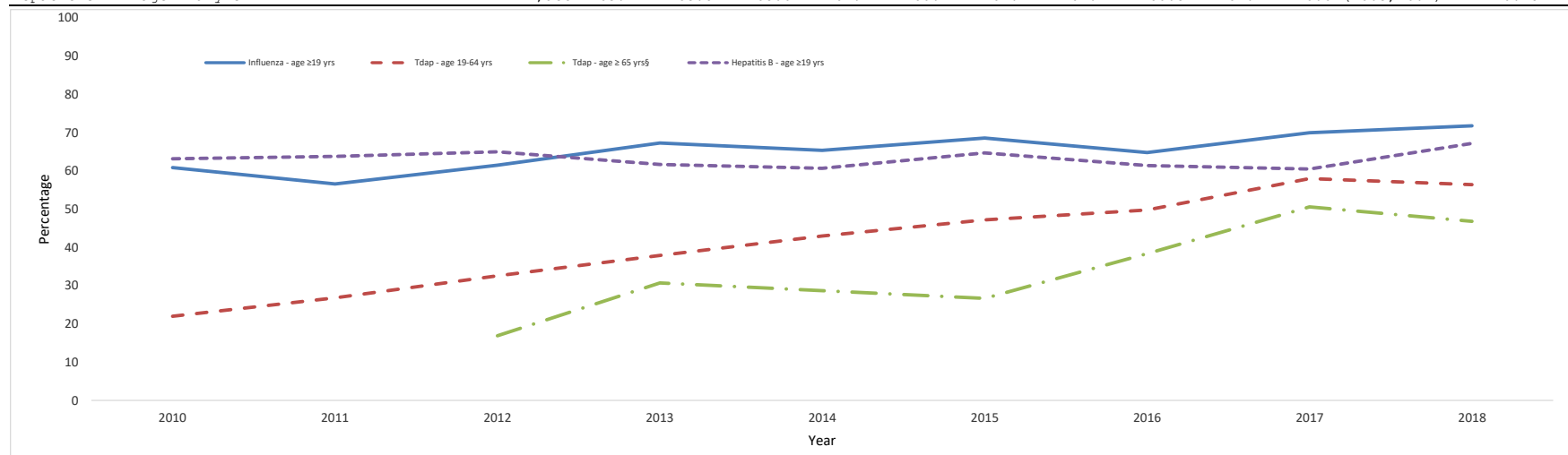
SUPPLEMENTARY BOX 2. Vaccination coverage among health care personnel (HCP) aged ≥ 19 years for selected vaccines — National Health Interview Survey, United States, 2018

Supplementary Tables/Figure	Result summary
Proportion of Health Care Personnel Who Received Selected Vaccinations	Overall, in 2018, hepatitis B vaccination coverage increased 6.7 percentage points to 67.2% among HCP aged ≥ 19 years compared with the 2017 estimate. Influenza (71.8%) and tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine (Tdap) (55.8%) vaccination coverage for 2018 among HCP aged ≥ 19 years were similar to the 2017 estimates. Among all HCP, white HCP had higher Tdap (60.9%) and hepatitis B coverage (70.9%) compared with black HCP (37.9% and 56.3%, respectively) and Hispanic HCP (46.7% and 57.2%, respectively) (Table 1).
Proportion of Health Care Personnel with Direct Patient Care Who Received Selected Vaccinations	Overall, in 2018, hepatitis B vaccination coverage increased 5.5 percentage points to 75.3% among HCP aged ≥ 19 years with direct patient care, compared with the estimate for 2017. Hepatitis B vaccination coverage increased 8.1 percentage points to 50.9% among HCP aged ≥ 19 years without direct patient care, compared with the estimate for 2017. Influenza and Tdap vaccination coverage for 2018 among HCP aged ≥ 19 years with or without direct patient care were similar to the 2017 estimates. Tdap and hepatitis B vaccination coverage was higher among HCP with direct patient care compared with those without direct patient care. Among HCP with direct patient care, influenza coverage among white HCP was similar (72.3%) compared with that for black (75.0%) and Hispanic (70.3%) HCP. Black HCP and Hispanic HCP with direct patient care responsibilities had lower Tdap (38.9% and 50.5%, respectively) and hepatitis B coverage (58.1% and 62.6%, respectively) compared with white HCP (67.6% and 82.3%, respectively). (Table 2).
Proportion of Adults Who Received Tdap Among Those Reporting Tetanus	Among adults aged ≥ 19 years, 42.6% reported they knew what type of tetanus vaccine they received, 40.6% reported they were not informed of the vaccination type, and 16.8% could not recall the type

Vaccination by Health Care Personnel Status	of tetanus vaccination received. Among those who reported they knew what type tetanus vaccine they received, 74.4% reported receiving Tdap. HCP reported receipt of Tdap (83.0%) more often than did non-HCP (72.7%) (Table 3).
Trends in Vaccination Coverage Among Health Care Personnel for Select Vaccines	Linear trend tests indicated influenza vaccination coverage among HCP aged ≥ 19 years increased from the 2009–10 to 2017–18 influenza seasons with an average annual change of 1.6 percentage points. Tdap coverage among HCP aged 19–64 years increased during 2010 through 2018 (range: 22.0%–56.4%) with annual average percentage point increases of 4.6 percentage points. During 2012 through 2018, Tdap coverage among HCP aged ≥ 65 years increased (range: 16.9%–46.8%) with an average annual percentage point change of 4.9 percentage points. During 2010–2018, hepatitis B vaccination remained stable among HCP aged ≥ 19 years (Figure).

SUPPLEMENTARY BOX 2, FIGURE. Estimated proportion of health care personnel* aged ≥19 years who received influenza,[†] Tdap, and hepatitis B vaccines, by age group – National Health Interview Survey, United States, 2010–2018

	Unweighted sample size (2010– 2018)	2010	2011	2012	2013	2014	2015	2016	2017	2018	Average annual change (95%CI)	Linear trend test p-value
Influenza – age ≥19 yrs	21,021	60.9	56.6	61.5	67.3	65.4	68.6	64.8	70.0	71.8	1.6 (0.8, 2.3)	<0.01
Tdap – age 19–64 yrs	14,728	22.0	26.8	32.6	37.9	43.0	47.2	49.8	58.0	56.4	4.6 (4.0, 5.1)	<0.01
Tdap – age ≥ 65 yrs [§]	1,291			16.9	30.7	28.7	26.7	38.4	50.6	46.8	4.9 (2.7, 7.1)	<0.01
Hepatitis B – age ≥19 yrs	21,938	63.2	63.8	65.0	61.7	60.7	64.7	61.4	60.5	67.2	0.0 (–0.3, 0.4)	0.78



Abbreviations: Tdap = Tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine.

* Adults were classified as health care personnel if they reported they currently volunteer or work in a hospital, medical clinic, doctor's office, dentist's office, nursing home or some other health-care facility including part-time and unpaid work in a health care facility as well as professional nursing care provided in the home.

[†] Influenza vaccination coverage for 2010 is coverage from the 2009–10 season, 2011 is coverage from the 2010–11 season, 2012 is coverage from the 2011–12 season, 2013 is coverage from the 2012–13 season, 2014 is coverage from the 2013–14 season, 2015 is coverage from the 2014–15 season, 2016 is coverage from the 2015–16 season, 2017 is coverage from 2016–2017 season, and 2018 is coverage from 2017–18 season. Interviews from August through June of each season were used to estimate coverage from July through May using Kaplan-Meier survival analysis.

[§] Tdap vaccination coverage data among adults aged ≥65 years are available beginning in the NHIS 2012 survey.

SUPPLEMENTARY BOX 2, TABLE 1. Estimated proportion of health care personnel* who received selected vaccinations, by race/ethnicity[†] – National Health Interview Survey, United States, 2018

Vaccination and race/ethnicity	Sample size	% (95% CI)	Simple difference from 2017
Influenza vaccination, 2017–18 season[§]			
≥19 yrs			
Total	1,824	71.8 (68.6, 75.0)	1.8
White	1,230	71.9 (68.1, 75.7)	-0.2
Black	227	72.2 (64.4, 79.6)	11.3 [¶]
Hispanic	222	71.7 (60.5, 82.1)	5.7
Asian	100	72.6 (60.5, 83.6)	-5.2
Other	45	65.5 (47.0, 83.3)	-5.4
19–49 yrs			
Total	1,128	67.9 (63.6, 72.1)	-0.2
White	714	68.9 (63.5, 74.1)	-1.9
Black	147	63.7 (53.3, 74.1)	5.9
Hispanic	164	70.0 (55.3, 83.5)	5.8
Asian	72	66.9 (51.6, 81.4)	-6.7
Other	31	65.8 (43.3, 86.9)	-10.5
50–64 yrs			
Total	500	79.4 (74.3, 84.1)	6.9
White	362	76.2 (69.7, 82.2)	3.8
Black	57	91.0 (82.2, 96.6)**	22.3 [¶]
Hispanic	47	79.3 (63.9, 91.3)	4.2
Asian	23	-- ^{††} --	--
Other	11	-- --	--
≥65 yrs			
Total	196	81.1 (73.4, 87.7)	3.7
White	154	80.1 (70.7, 87.9)	0.5
Black	23	-- --	--
Hispanic	11	-- --	--
Asian	5	-- --	--
Other	3	-- --	--
Tetanus vaccination including pertussis vaccine, past 10 years^{§§}			
≥19 yrs			
Total	1,507	55.8 (52.6, 59.0)	-1.7
White	1,013	60.9 (57.2, 64.5)	1.1
Black	199	37.9 (30.0, 46.6)**	-6.2
Hispanic	163	46.7 (38.1, 55.6)**	-6.0
Asian	92	63.4 (50.8, 74.4)	-2.2
Other	40	63.0 (44.3, 78.4)	-8.1
19–64 yrs			
Total	1,352	56.4 (53.0, 59.8)	-1.6
White	892	61.7 (57.8, 65.5)	1.1
Black	182	38.3 (30.1, 47.3)**	-6.2
Hispanic	156	47.7 (38.9, 56.6)**	-5.1
Asian	86	64.0 (51.2, 75.1)	-1.5
Other	36	65.6 (46.0, 81.1)	-3.3
≥65 yrs			
Total	155	46.8 (37.5, 56.4)	-3.8
White	121	51.6 (40.6, 62.4)	1.1
Black	17	-- --	--
Hispanic	7	-- --	--
Asian	6	-- --	--
Other	4	-- --	--
Hepatitis B vaccination (at least 3 doses), ever^{¶¶}			
≥19 yrs			
Total	2,012	67.2 (64.5, 69.7)	6.7[¶]
White	1,366	70.9 (67.9, 73.7)	7.4 [¶]
Black	268	56.3 (48.2, 64.2)**	8.9
Hispanic	208	57.2 (49.4, 64.7)**	5.4
Asian	118	76.7 (66.4, 84.6)	1.9

Abbreviations: CI = confidence interval; Td = Tetanus and diphtheria toxoids; Tdap =Tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine.

* Adults were classified as health care personnel if they reported they currently volunteer or work in a hospital, medical clinic, doctor's office, dentist's office, nursing home or some other health care facility including part-time and unpaid work in a health care facility as well as professional nursing care provided in the home.

[†] Race/ethnicity was categorized as follows: white, black, Hispanic, Asian and "other." In this report, persons identified as white, black, Asian, or other race are non-Hispanic. Persons identified as Hispanic might be of any race. "Other" includes American Indian/Alaska Native and persons who identified multiple races. The five racial/ethnic categories are mutually exclusive.

[§] Respondents were asked if they had received an influenza shot or nasal spray in the past 12 months and if so, in which month and year. Missing month and year were imputed (2.9%), and interviews conducted during August 2017-June 2018 were used to estimate vaccination coverage during July 2017-May 2018 using Kaplan-Meier survival analysis. Differences were measured as the simple difference between the 2016-17 and 2017-18 influenza seasons.

[§] p<0.05 by t-test for comparisons between 2018 and 2017 within each level of each characteristic.

** p<0.05 by t-test for comparisons with white as the reference group.

^{††} Estimate is not reliable due to small sample size (n<30) or relative standard error (standard error/estimates)>0.3.

^{§§} Respondents who had received a tetanus shot in the past 10 years were asked if their most recent shot included the pertussis or whooping cough vaccine. Among 2,174 health care personnel aged ≥19 years, those without a "yes" or "no" classification for tetanus vaccination status within the preceding 10 years (n = 66 [3.0%]), those who reported tetanus vaccination in the past 10 years but were not told vaccine type by the provider (n = 427 [19.6%]), or did not know vaccine type (Td or Tdap) (n = 174 [8.0%]), or refused to answer (n=0 [0.0%]) were excluded, yielding a sample of 1,507 respondents aged ≥19 years for whom Tdap vaccination status could be assessed. In February 2012, the Advisory Committee on Immunization Practices recommended Tdap vaccination for all adults aged ≥19 years, including adults aged ≥65 years.

^{§§} Respondents were asked if they had ever received the hepatitis B vaccine, and if yes, if they had received at least 3 doses or less than 3 doses.

SUPPLEMENTARY BOX 2, TABLE 2. Estimated proportion of health care personnel* with direct patient care responsibilities who received selected vaccinations, by race/ethnicity – National Health Interview Survey, United States, 2018

Vaccination, direct patient care responsibilities,[†] and race/ethnicity[§]	Sample size	% (95% CI)	Simple difference from 2017
Influenza vaccination, 2017–18 season[‡]			
≥19 yrs, with direct patient care responsibilities			
Total	1,115	72.6 (68.5, 76.6)	1.7
White	747	72.3 (67.5, 76.9)	-1.1
Black	141	75.0 (65.3, 83.7)	9.7
Hispanic	130	70.3 (55.3, 83.9)	14.9
Asian	71	76.8 (63.6, 87.9)	-0.9
Other	26	---* --	--
≥19 yrs, without direct patient care responsibilities			
Total	709	70.5 (65.2, 75.6)	2.4
White	483	71.2 (64.7, 77.5)	1.7
Black	86	66.9 (52.1, 81.1)	15.0
Hispanic	92	73.2 (60.8, 84.4)	-12.1
Asian	29	-- --	--
Other	19	-- --	--
Tetanus vaccination including pertussis vaccine, past 10 years^{††}			
≥19 yrs, with direct patient care responsibilities			
Total	982	60.2 (56.0, 64.2)	-1.6
White	635	67.6 (62.9, 72.0)	3.2
Black	139	38.9 (29.3, 49.4) ^{§§}	-8.0
Hispanic	109	50.5 (40.4, 60.5) ^{§§}	-3.3
Asian	69	65.7 (50.3, 78.3)	-2.8
Other	30	62.8 (42.0, 79.8)	---***
≥19 yrs, without direct patient care responsibilities			
Total	525	46.6 (41.4, 51.8)^{¶¶}	-2.4
White	378	48.9 (42.9, 55.0) ^{¶¶}	-1.6
Black	60	35.1 (22.4, 50.4)	-4.5
Hispanic	54	37.5 (23.7, 53.8)	-13.4
Asian	23	-- --	--
Other	10	-- --	--
Hepatitis B vaccination (at least 3 doses), ever^{†††}			
≥19 yrs, with direct patient care responsibilities			
Total	1,279	75.3 (72.2, 78.2)	5.5^{§§§}
White	836	82.3 (79.0, 85.1)	8.6 ^{§§§}
Black	179	58.1 (48.2, 67.4) ^{§§}	1.0
Hispanic	137	62.6 (52.6, 71.6) ^{§§}	8.3
Asian	91	80.6 (68.9, 88.7)	-2.0
Other	36	66.3 (45.4, 82.3)	0.1
≥19 yrs, without direct patient care responsibilities			
Total	733	50.9 (46.4, 55.3)^{¶¶}	8.1^{§§§}
White	530	51.2 (45.9, 56.4) ^{¶¶}	5.8
Black	89	52.2 (39.1, 65.0)	23.3 ^{§§§}
Hispanic	71	44.2 (32.0, 57.2) ^{¶¶}	-3.7
Asian	27	-- --	--
Other	16	-- --	--

Abbreviations: CI = confidence interval; HCP = health care personnel; Td = Tetanus and diphtheria toxoids; Tdap = Tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine.

* Adults were classified as HCP if they reported that they currently volunteer or work in a hospital, medical clinic, doctor's office, dentist's office, nursing home or some other health care facility including part-time and unpaid work in a health care facility as well as professional nursing care provided in the home.

[†] HCP were classified as having direct patient care if they reported providing direct patient care (physical or hands on contact with patients) as part of their routine work.

[§] Race/ethnicity was categorized as follows: white, black, Hispanic, Asian and "other." In this report, persons identified as white, black, Asian, or other race are non-Hispanic. Persons identified as Hispanic might be of any race. "Other" includes American Indian/Alaska Native and persons who identified multiple races. The five racial/ethnic categories are mutually exclusive.

[§] Respondents were asked if they had received an influenza shot or nasal spray in the past 12 months and if so, in which month and year. Missing month and year were imputed (with direct patient care, 3.4%; without direct patient care, 2.0%), and interviews conducted during August 2017–June 2018 were used to estimate vaccination coverage during July 2017–May 2018 using Kaplan-Meier survival analysis. Differences were measured as the simple difference between the 2016–17 and 2017–18 influenza seasons.

** Estimate is not reliable due to small sample size ($n < 30$) or relative standard error (standard error/estimates) > 0.3 .

^{††} Respondents who had received a tetanus shot in the past 10 years were asked if their most recent shot included the pertussis or whooping cough vaccine. Among 2,174 health care personnel aged ≥ 19 years, those without a "yes" or "no" classification for tetanus vaccination status within the preceding 10 years ($n = 66$ [3.0%]), those who reported tetanus vaccination in the past 10 years but were not told vaccine type by the provider ($n = 427$ [19.6%]), or did not know vaccine type (Td or Tdap) ($n = 174$ [8.0%]), or refused to answer ($n = 0$ [0.0%]) were excluded, yielding a sample of 1,507 respondents aged ≥ 19 years for whom Tdap vaccination status could be assessed. In February 2012, the Advisory Committee on Immunization Practices recommended Tdap vaccination for all adults aged ≥ 19 years, including adults aged ≥ 65 years.

^{§§} $p < 0.05$ by t-test for comparisons with white as the reference group.

^{§§} $p < 0.05$ by t-test for comparisons with HCP without direct patient care responsibilities as a reference group.

*** Difference could not be estimated because estimate from previous season was suppressed.

^{†††} Respondents were asked if they had ever received the hepatitis B vaccine, and if yes, if they had received at least 3 doses or less than 3 doses.

^{§§§} $p < 0.05$ by t-test for comparisons between 2017 and 2018 within each level of each characteristic.

SUPPLEMENTARY BOX 2, TABLE 3. Type of tetanus vaccine received, and proportion that were tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine (Tdap), among adults aged ≥19 years, by health care personnel status and other selected characteristics – National Health Interview Survey, United States, 2018

Characteristic	Type of tetanus toxoid-containing vaccine received during past 10 years						Proportion that was Tdap of the total tetanus toxoid-containing vaccine during past 10 years*					
	No. in sample	Received Tdap		Received other tetanus vaccine		Doctor did not inform the patient		Could not recall vaccine type		No. in sample	%	(95% CI)
		%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)			
Age group (yrs)												
≥19												
Total	15,018	31.7	(30.5, 32.9)	10.9	(10.2, 11.6)	40.6	(39.1, 42.2)	16.8	(15.6, 18.0)	6,323	74.4	(72.9, 75.9)
HCP†	1,630	52.3	(49.3, 55.3)	10.7	(9.1, 12.5)	27.5	(24.7, 30.6)	9.5	(7.9, 11.3)	1,029	83.0§	(80.2, 85.5)
Non-HCP	13,373	29.1	(27.8, 30.3)	10.9	(10.2, 11.7)	42.3	(40.8, 43.9)	17.7	(16.4, 19.0)	5,291	72.7	(71.0, 74.3)
19–64												
Total	11,056	33.7	(32.4, 35.0)	10.5	(9.8, 11.3)	39.3	(37.7, 41.0)	16.5	(15.3, 17.8)	4,921	76.2	(74.5, 77.7)
HCP	1,458	53.3	(50.2, 56.4)	10.3	(8.7, 12.2)	27.2	(24.2, 30.4)	9.2	(7.6, 11.1)	938	83.8§	(81.0, 86.3)
Non-HCP	9,587	30.7	(29.4, 32.1)	10.6	(9.8, 11.4)	41.1	(39.4, 42.9)	17.6	(16.3, 19.0)	3,981	74.4	(72.5, 76.2)
≥65												
Total	3,962	23.4	(21.7, 25.3)	12.4	(11.2, 13.7)	46.3	(44.1, 48.4)	17.9	(16.2, 19.8)	1,402	65.4	(62.1, 68.6)
HCP	172	39.1	(30.8, 48.1)	15.6	(9.8, 23.9)	32	(24.3, 40.8)	13.4	(8.3, 20.8)	91	71.5	(58.6, 81.6)
Non-HCP	3,786	22.7	(21.0, 24.6)	12.2	(11.0, 13.6)	46.9	(44.7, 49.1)	18.1	(16.4, 20.0)	1,310	65	(61.6, 68.4)

Abbreviations: CI = confidence interval; HCP = health care personnel; Tdap = Tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine.

* Calculated by dividing the number of respondents who reported receiving Tdap by the sum of those who reported receiving Tdap and those who reported receiving other tetanus vaccination; respondents who reported that the doctor did not inform them of the vaccine type they received and those who could not recall the vaccine type were excluded.

[†] Adults were classified as HCP if they reported they currently volunteer or work in a hospital, medical clinic, doctor's office, dentist's office, nursing home or some other health care facility including part-time and unpaid work in a health care facility as well as professional nursing care provided in the home. Among respondents aged ≥19 years who reported if they work or volunteer in a health care setting, 15 (0.1%) of those without a "yes" or "no" answer (refused, not ascertained, or don't know) were excluded from the analysis; of those excluded, 11 respondents (0.1%) were aged 19-64 years, and 4 (0.1%) were aged ≥65 years.

[§] p<0.05 by t-test for comparisons between HCP and non-HCP.