Gardasil Project.

Data

The Gardasil data include measurements from 1413 females, 731 of whom are white and 443 of whom are black. In addition, 962 females visited rural clinics and 449 visited urban clinics. The females ranged in age from 9 to 34 years, with 766 equals to and over the age of 18 and 645 under the age of 18. Furthermore, 84 of these women had hospital-based insurance, 274 had medical assistance, 330 had military insurance, and 723 were private payers.

Methodology

Exploratory data analysis

The difference in completion rates based on race, age, shots, and insurance type was visualized using frequency distributions and stacked bar graphs.

Odds Ratio

The odds ratio (OR) is a common statistic used to compare how likely it is that an event will happen in two groups or categories of a variable. The OR is found by dividing the odds that an event will occur in one group by the odds that it will occur in the other group.

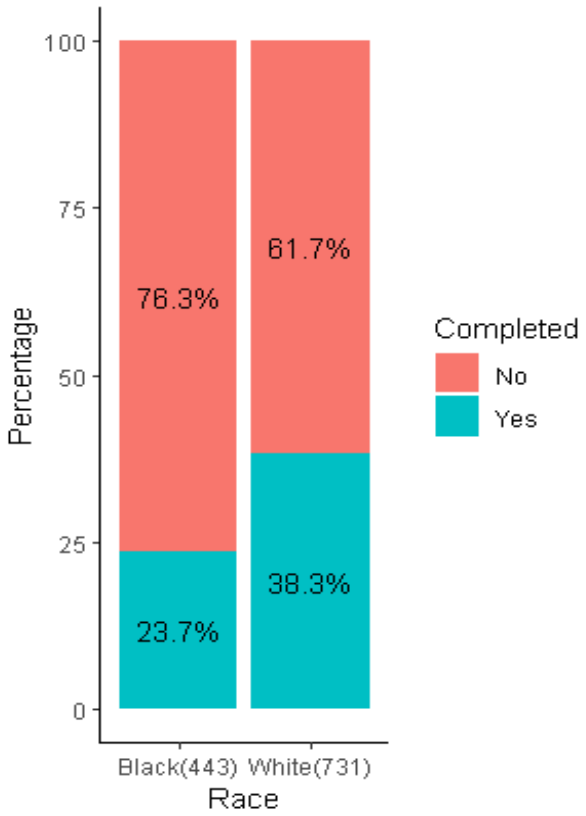
Chi-square test of Homogeneity

The Chi-square test of homogeneity is used to find out if frequency counts are spread the same way across different populations or across different subgroups of the same population.

Results and Discussion

Research Question 1: Is there a difference in odds of completion for white vs black women?

Merely 280 (38.3%) of 731 white females completed their vaccination doses within 12 months, whereas 105 (23.7%) of 443 black females did so. The odds ratio for completion, white female vs black female, is therefore 1.9985. That means white women are almost twice as likely as black women to complete their vaccine doses within 12 months period. A 95% confidence interval for the OR is [1.7336, 2.2635]. Since the confidence interval contains only values greater than 1, we can say that we are 95% confident that the odds in favor of completion are higher for white women than for black women.

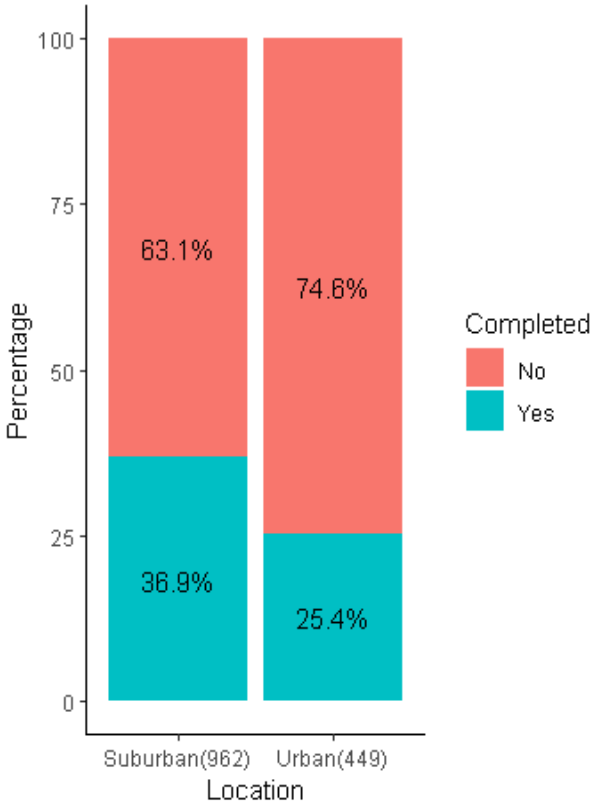


	Race	
Completed	White	Black
Yes	280(38.3%)	105(23.70%)
No	451(61.7%)	338(79.3%)

Table: Contingency table of conditional distribution of Race vs Completion rate

Research Question 2: Is there a difference in odds of completion for urban vs suburban clinics?

In contrast to 114(25.4%) of 449 females who received their vaccinations from urban clinics, 355(36.9%) of 962 females who got their vaccinations from suburban clinics finished them within a year. Hence, the odds ratio for completion in urban vs. suburban clinics is 1.7186. In other words, the odds of finishing in a suburban clinic are 72% higher than the odds of finishing at an urban clinic. The OR has a 95% confidence interval of [1.4690, 1.9683]. We can state with 95% confidence that the odds of completion are higher for suburban clinic than from urban clinic because the confidence interval only contains values greater than 1.

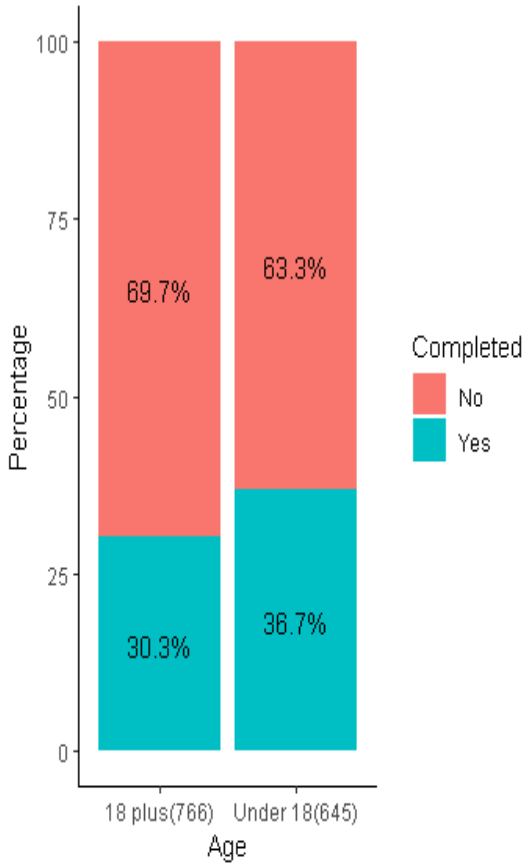


	Location	
Completed	Suburban	Urban
Yes	355(36.9%)	114(25.39%)
No	607(63.1%)	335(74.61%)

Table: Contingency table of conditional distribution of Clinic Location vs Completion rate

Research Question 3: Does odds of completion change with age?

In comparison to 232 (30.3%) of 766 females who were 18 years of age years of age and older, 237 (36.7%) of 645 females who were less than 18 years of age completed their vaccine doses within a year. Hence, the odds ratio for completion in females under 18 compared to females over 18 is 1.3370. In other words, the likelihood of completion for women under the age of 18 is 34% higher than for women beyond the age of 18. The 95% confidence interval for the OR is [1.1148, 1.5592]. Because the confidence interval only contains values greater than 1, we can say with 95% certainty that the odds of completion are higher for females under 18 than for females over 18.



	AgeGroup	
Completed	Under 18	18 plus
Yes	237(36.74%)	232(30.29%)
No	408(63.26%)	534(69.71%)

Table: Contingency table of conditional distribution of Age group vs Completion rate

Research Question 4: Is the odds of completion associated with the type of insurance?

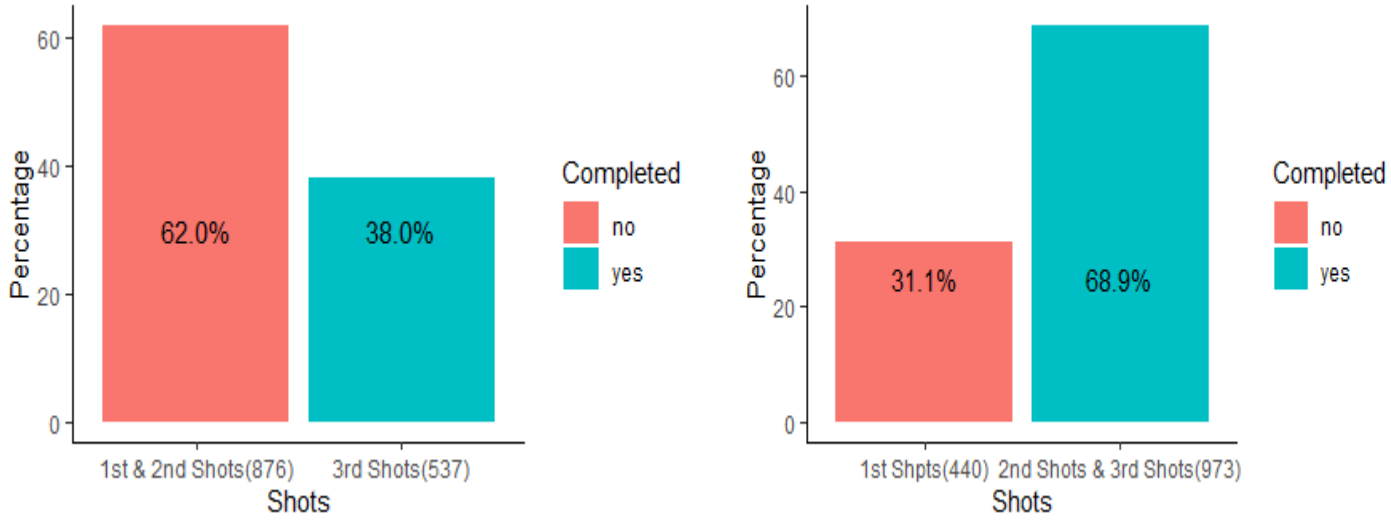
	Insurance type				
Completed	Medical assistance	Private Payer	Hospital based	Military	Total
Yes	55(91.07)	253(240.32)	39(27.92)	122(109.69)	469
No	219(182.93)	470(482.68)	45(56.08)	208(220.31)	942
Total	274	723	84	330	1411

Table: Observed and Expected counts for Insurance type Chi-square test of homogeneity

Completion rates for predictors with more than two categories (type of insurance) can be analyzed using a chi-square test of homogeneity, with the predictor variable categories providing one dimension of the table (row or column) and "completion"/ "non-completion" counts providing the other.

The chi-square test indicates $\chi 2 = 31.061$, df = 3 and P = 0.0000, indicating that completion rate is different for at least two of the three insurance types. Hence, the odds of completion are associated with type of insurance.

Follow-up question: The modern Gardasil is now only 2 doses. Hypothetically, if these women only needed 2 shots would the relationship with completion change?



	Shots	
Completed	3 Shots	2 Shots
Yes	537(38.00%)	973(68.90%)
No	876(62.00%)	440(31.10%)

537(38.00%) of 1413 women would have finished the injections if the current Gardasil vaccine required 3 doses. If the new Gardasil vaccine requires two doses, then 973(68.90%) of women have received both doses. Hypothetically, The association with completion will be improved if these women just need two shots.