

# *Impact of healthcare access and HIV testing on utilisation of cervical cancer screening among US women at high risk of HIV infection: cross-sectional analysis of 2016 BRFSS data*

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## A Study in Replication

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Analysis of Large Scale Data  
P8508

# Background

- Cervical cancer is a major gynecologic cancer affecting women's health both in the US and worldwide
  - It is the only gynecologic cancer with screening tests which help with early detection
- BRFSS 2016 Data and Documentation
- Study analyzes the association of cervical cancer screening with healthcare access and HIV testing among women at high risk of HIV infection



# Methodology + Results

- Study Population: 3448 women with a history of high-risk behaviors associated with HIV infection
- Exposures:
  - Clinical check-up
  - Personal healthcare provider
  - Health coverage
  - HIV testing history
- Outcome:
  - Cervical cancer screening
- Multivariable logistic regression model
  - Associations of healthcare access + HIV testing with uptake of cervical cancer screening; reported adjusted OR and 95%CI
- A total of 2911 (84.4%) of high-risk women underwent cervical cancer screening
- Factors inversely associated with cervical cancer screening uptake
  - Delayed clinical checkup
  - No health insurance
  - No history of HIV testing

# Our Approach to Replication

```
69 *Marital Status
70 gen married=1 if marital==1 | marital==6
71 replace married=0 if marital==2 | marital==3 | marital==4 | marital==5
72 replace married=. if marital==9 | marital==.
73
74 *BMI
75 gen bmi=0 if _bmi5cat==1 | _bmi5cat==2 | _bmi5cat==3
76 replace bmi=1 if _bmi5cat==4
77 replace bmi=. if _bmi5cat==.
78
79 *Physical Activity/Exercise
80 gen actexc=0 if _totinda==2
81 replace actexc=1 if _totinda==1
82 replace actexc=. if _totinda==9
83
84 *Heavy Drinker
85 gen funperson=0 if _rfrdrhv5==1
86 replace funperson=1 if _rfrdrhv5==2
87 replace funperson=. if _rfrdrhv5==9
88
89 *Smoking Status
90 gen smoker=0 if _smoker3==4
91 replace smoker=1 if _smoker3==1 | _smoker3==2
92 replace smoker=2 if _smoker3==3
93 replace smoker=. if _smoker3==9
94
95 *Self-reported Perceived Health Condition
96 gen healthcond=0 if genhlth==4 | genhlth==5
97 replace healthcond=1 if genhlth==1 | genhlth==2 | genhlth==3
98 replace healthcond=. if genhlth==7 | genhlth==9 | genhlth==.
99
```

```
*Routine Clinical Check-Up
gen clinicalcheck=0 if checkup1==1
replace clinicalcheck=1 if checkup1==2
replace clinicalcheck=2 if checkup1==3
replace clinicalcheck=3 if checkup1==4
replace clinicalcheck=. if checkup1==7 | checkup1==8 | checkup1==9 | checkup1==.

*Personal Healthcare Provider
gen provider=0 if persdoc2==1 | persdoc2==2
replace provider=1 if persdoc2==3
replace provider=. if persdoc2==7 | persdoc2==9 | persdoc2==.

*Health Coverage
gen hlthcvg=0 if hlthpln1==1
replace hlthcvg=1 if hlthpln1==2
replace hlthcvg=. if hlthpln1==7 | hlthpln1==9

*Categorized age
gen agecat=0 if _ageg5yr==2 | _ageg5yr==3
replace agecat=1 if _ageg5yr==4 | _ageg5yr==5
replace agecat=2 if _ageg5yr==6 | _ageg5yr==7
replace agecat=3 if _ageg5yr==8 | _ageg5yr==9t

*Race
gen race=0 if _race_g1==1
replace race=1 if _race_g1==2
replace race=2 if _race_g1==4 | _race_g1==5
replace race=. if _race_g1==.

*Educational Background
gen education=0 if _educag==1 | _educag==2
replace education=1 if _educag==3
replace education=2 if _educag==4
replace education=. if _educag==9
```

# Our Approach to Replication

```
*Had Cervical screening or NOT*****  
*Create age variable for 30-65 or not  
gen age3065=1 if _age5yr==3 | _age5yr==4 | _age5yr==5 | _age5yr==6 | _age5yr==7 | _age5yr==8 | _age5yr==9  
  
gen cervical=.  
replace cervical = 1 if _rfpap33==1  
replace cervical = 1 if age3065==1 & hpvtest==1 & lastpap2==1 | lastpap2==2 | lastpap2==3 | lastpap2==4  
replace cervical = 0 if cervical==.
```

# Our Approach to Replication

```
159 *Comorbidities/Common Illnesses*****
160 *create binary variables for each illness
161 gen asthmabi=0 if asthma3==2
162 replace asthmabi=1 if asthma3==1
163 replace asthmabi=. if asthma3==7 | asthma3==9 | asthma3==.
164
165 gen copdbi=0 if chccopd1==2
166 replace copdbi=1 if chccopd1==1
167 replace copdbi=. if chccopd1==7 | chccopd1==9 | chccopd1==.
168
169 gen diabetebi=0 if diabete3==3
170 replace diabetebi=1 if diabete3==1 | diabete3==2
171 replace diabetebi=. if diabete3==7 | diabete3==9 | diabete3==.
172
173 gen mibi=0 if _michd==2
174 replace mibi=1 if _michd==1
175 replace mibi=. if _michd==.
176
177 gen chdbi=0 if cvdcrhd4==2
178 replace chdbi=1 if cvdcrhd4==1
179 replace chdbi=. if cvdcrhd4==7 | cvdcrhd4==9 | cvdcrhd4==.
180
181 gen strokebi=0 if cvdstrk3==2
182 replace strokebi=1 if cvdstrk3==1
183 replace strokebi=. if cvdstrk3==7 | cvdstrk3==9 | cvdstrk3==.
184
185 gen kidneybi=0 if chckidny==2
186 replace kidneybi=1 if chckidny==1
187 replace kidneybi=. if chckidny==7 | chckidny==9 | chckidny==.
188
189 gen arthritisbi=0 if havarth3==2
190 replace arthritisbi=1 if havarth3==1
191 replace arthritisbi=. if havarth3==7 | havarth3==9 | havarth3==.
192
193 drop if asthmabi==. | copdbi==. | diabetebi==. | mibi==. | chdbi==. | strokebi==. | kidneybi==. | arthritisbi==.
194 gen countillness = asthmabi+copdbi+diabetebi+mibi+chdbi+strokebi+kidneybi+arthritisbi
195 gen illness=0 if countillness==0
196 replace illness=1 if countillness==1
197 replace illness=2 if countillness>1
198
199 drop if clinicalcheck==. | provider==. | hlthcvg==. | race==. | education==. | married==. | bmi==. | actexc==. | funperson==. | smoker==. |
  5 healthcond==.
```

# Our Approach to Replication

```
*HIV TEST*

Convert idate (string) to time variable
gen interviewdate = date(idate, "DMY")
format interviewdate %td

*Extract month and year from interviewdate variable
gen interviewmonth = month(interviewdate)
gen interviewyr = year(interviewdate)
*Create a new variable (interviewYM) with year and month from interviewdate
gen interviewYM = ym(interviewyr, interviewmonth)
format interviewYM %tm

*Convert hivtstd3 (string) to time variable
tostring hivtstd3, generate (hivstring)
gen HIVdate = date(hivstring, "MY")
format HIVdate %tm

*Extract month and year from hivtstd3 variable
gen HIVmonth = month(HIVdate)
gen HIVyr = year(HIVdate)
*Create a new variable (hivYM) with year and month from hivtstd3
gen hivYM = ym(HIVyr, HIVmonth)
format hivYM %tm

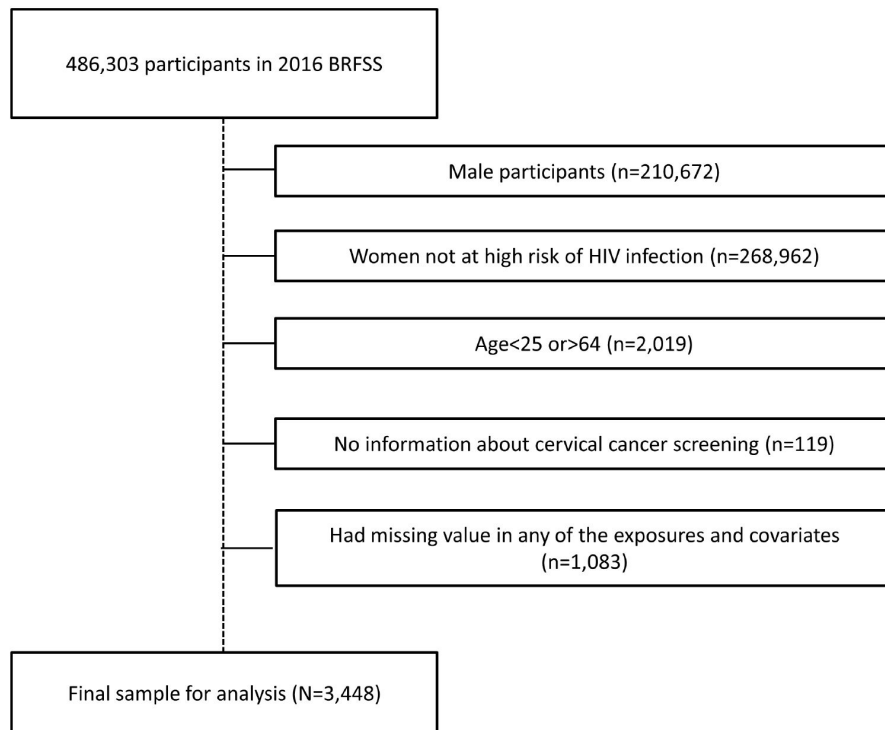
*any missing values/refused to answer values were not counted in building these variables

drop if HIVyr==1191

*generate variable to determine time since last test with interview date as point of reference
gen timesincetest = interviewYM - hivYM
tab timesincetest
* negative variable outut (negative months) were observed when tabbing timesincetest
* counting 257 negative observations which will not be counted in var timetest
gen timetest=0 if timesincetest>=0 & timesincetest<=12
replace timetest=1 if timesincetest>12 & timesincetest<=400
tab timetest

gen hivtest=0 if hivtst6==1 & timetest==0
replace hivtest=1 if hivtst6==1 & timetest==1
replace hivtest=2 if hivtst6==2
replace hivtest=. if hivtst6==7 | hivtst6==9 | hivtst6==.*/
```

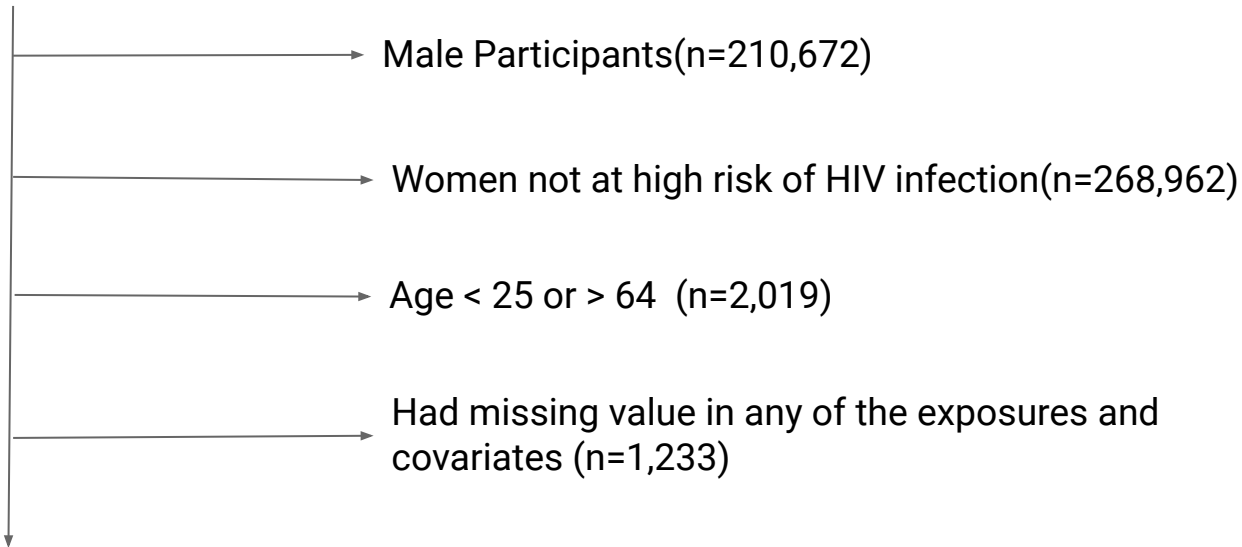
# The Study Sample



**Figure 1** Flowchart of selection of study population. A total of 3448 women at a high risk of HIV infection were included for current study. BRFSS, Behavioral Risk Factor Surveillance System.

# Our Selection Criteria Process

486,303 Participants in 2016 BRFSS



Final Sample for analysis(N=3417)

# Statistical Analysis

The analyses were as follows:

- Table 1: Characteristics of women at high risk for HIV infection
  - No Cervical Cancer Screening vs Cervical Cancer screening
  - Cervical cancer screening was defined as the following
    - Women aged between 21 and 65 having a pap test within 3 years
    - Women aged between 30 and 65 having a Pap test within the last 5 years accompanied by an HPV test
  - $\chi^2$  Test
- Table 2: Associations of healthcare access and HIV test with cervical cancer screening in women at a high risk of HIV infection
  - Adjusted and Crude Odds Ratios
    - Crude ORs were calculated using a multivariable logistic regression that included the four factors in the table
    - Adjusted odds ratios used the same logistic regression model but adjusted for the following variables:
      - age, race, education, marital status, obesity, physical activity, alcohol consumption, smoking status, comorbidity, and overall health condition
- Table 3: Associations of healthcare access and HIV test with cervical cancer screening in subgroups defined by education

**Table 1** Study characteristics of women at high risk of HIV infection—2016 BRFSS

|                              | Overall<br>(n=3448) | Had no cervical<br>cancer screening<br>(n=537 15.6%) | Had cervical cancer<br>screening<br>(n=2911 84.4%) |          |
|------------------------------|---------------------|------------------------------------------------------|----------------------------------------------------|----------|
| Study characteristics        | n (%)               | n (%)                                                | n (%)                                              | P value‡ |
| Age at interview (years)     |                     |                                                      |                                                    |          |
| 25–34                        | 1477 (42.8)         | 184 (34.3)                                           | 1293 (44.4)                                        | <0.01    |
| 35–44                        | 913 (26.5)          | 128 (23.8)                                           | 785 (27.0)                                         |          |
| 45–54                        | 658 (19.1)          | 118 (22.0)                                           | 540 (18.5)                                         |          |
| 55–64                        | 400 (11.6)          | 107 (19.9)                                           | 293 (10.1)                                         |          |
| Race                         |                     |                                                      |                                                    |          |
| White                        | 2567 (74.5)         | 411 (76.5)                                           | 2156 (74.1)                                        | 0.06     |
| Black                        | 583 (16.9)          | 73 (13.6)                                            | 510 (17.5)                                         |          |
| Other                        | 298 (8.6)           | 53 (9.9)                                             | 245 (8.4)                                          |          |
| Level of education completed |                     |                                                      |                                                    |          |
| High school or less          | 1129 (32.7)         | 249 (46.4)                                           | 880 (30.2)                                         | <0.01    |
| Attended college             | 1056 (30.6)         | 167 (31.1)                                           | 889 (30.6)                                         |          |
| Graduated from college       | 1263 (36.6)         | 121 (22.5)                                           | 1142 (39.2)                                        |          |
| Marital status*              |                     |                                                      |                                                    |          |
| Unmarried                    | 2120 (61.5)         | 331 (61.6)                                           | 1789 (61.5)                                        | 0.94     |
| Married                      | 1328 (38.5)         | 206 (38.4)                                           | 1122 (38.5)                                        |          |
| Obesity (BMI ≥30kg/m²)       |                     |                                                      |                                                    |          |
| No                           | 2164 (62.8)         | 332 (61.8)                                           | 1832 (62.9)                                        | 0.63     |
| Yes                          | 1284 (37.2)         | 205 (38.2)                                           | 1079 (37.1)                                        |          |
| Regular physical exercise    |                     |                                                      |                                                    |          |
| No                           | 819 (23.8)          | 186 (34.6)                                           | 633 (21.8)                                         | <0.01    |
| Yes                          | 2629 (76.2)         | 351 (65.4)                                           | 2278 (78.2)                                        |          |

|                              |             |            |             |       |  |
|------------------------------|-------------|------------|-------------|-------|--|
| Heavy drinker                |             |            |             |       |  |
| No                           | 2905 (84.3) | 448 (83.4) | 2457 (84.4) | 0.57  |  |
| Yes                          | 543 (15.7)  | 89 (16.6)  | 454 (15.6)  |       |  |
| Smoking status               |             |            |             |       |  |
| Never                        | 1541 (44.7) | 189 (35.2) | 1352 (46.5) | <0.01 |  |
| Current smoker               | 1229 (35.6) | 270 (50.3) | 959 (32.9)  |       |  |
| Former smoker                | 678 (19.7)  | 78 (14.5)  | 600 (20.6)  |       |  |
| Number of comorbidities†     |             |            |             |       |  |
| 0                            | 1845 (53.5) | 258 (48.0) | 1587 (54.5) | <0.01 |  |
| 1                            | 949 (27.5)  | 147 (27.4) | 802 (27.6)  |       |  |
| ≥2                           | 654 (19.0)  | 132 (24.6) | 522 (17.9)  |       |  |
| Overall health condition     |             |            |             |       |  |
| Fair or poor                 | 784 (22.7)  | 176 (32.8) | 608 (20.9)  | <0.01 |  |
| Good, very good or excellent | 2664 (77.3) | 361 (67.2) | 2303 (79.1) |       |  |

Table 1 – Original (cont.)

|                                    | Overall<br>(n=3,417) | Had no cervical<br>cancer screening<br>(n=648 18.96%) | Had cervical cancer<br>screening<br>(n=3,417 81.04%) |         |
|------------------------------------|----------------------|-------------------------------------------------------|------------------------------------------------------|---------|
| Study characteristics              | n (%)                | n (%)                                                 | n (%)                                                | P value |
| Age at interview (years)           |                      |                                                       |                                                      |         |
| 25-34                              | 1,392 (40.74)        | 207 (31.94)                                           | 1185 (42.80)                                         | 0.000   |
| 35-44                              | 896 (26.22)          | 155 (23.92)                                           | 741 (26.76)                                          |         |
| 45-54                              | 706 (20.66)          | 168 (25.93)                                           | 538 (19.43)                                          |         |
| 55-64                              | 423 (12.38)          | 118 (18.21)                                           | 305 (11.01)                                          |         |
| Race                               |                      |                                                       |                                                      |         |
| White                              | 2,544 (74.45)        | 477 (73.61)                                           | 2,067 (74.65)                                        | 0.360   |
| Black                              | 588 (17.21)          | 108 (16.67)                                           | 480 (17.33)                                          |         |
| Other                              | 285 (8.34)           | 63 (9.72)                                             | 222 (8.02)                                           |         |
| Level of education completed       |                      |                                                       |                                                      |         |
| High school or less                | 1,077 (31.52)        | 281 (43.36)                                           | 796 (28.75)                                          | 0.000   |
| Attended college                   | 1,067 (31.23)        | 197 (30.40)                                           | 870 (31.42)                                          |         |
| Graduated from college             | 1,273 (37.25)        | 170 (26.23)                                           | 1,103 (39.83)                                        |         |
| Marital status                     |                      |                                                       |                                                      |         |
| Unmarried                          | 2,089 (61.14)        | 387 (59.72)                                           | 1,702 (61.47)                                        | 0.412   |
| Married                            | 1,328 (38.86)        | 261 (40.28)                                           | 1,067 (38.53)                                        |         |
| Obesity (BMI≥30kg/m <sup>2</sup> ) |                      |                                                       |                                                      |         |
| No                                 | 2,160 (63.21)        | 394 (60.80)                                           | 1,766 (63.78)                                        | 0.157   |
| Yes                                | 1,257 (36.79)        | 254 (39.20)                                           | 1,003 (36.22)                                        |         |
| Regular physical exercise          |                      |                                                       |                                                      |         |
| No                                 | 812 (23.76)          | 211 (32.56)                                           | 601 (21.70)                                          | 0.000   |
| Yes                                | 2,605 (76.24)        | 437 (67.44)                                           | 2,168 (78.30)                                        |         |

Table 1 – Replication

|                              |               |             |               |       |
|------------------------------|---------------|-------------|---------------|-------|
| Heavy Drinker                |               |             |               |       |
| No                           | 2,880 (84.28) | 550 (84.88) | 2,330 (84.15) | 0.645 |
| Yes                          | 537 (15.72)   | 98 (15.12)  | 439 (15.85)   |       |
| Smoking status               |               |             |               |       |
| Never                        | 1,504 (44.02) | 252 (38.89) | 1,252 (45.21) | 0.000 |
| Current smoker               | 1,235 (36.14) | 287 (44.29) | 948 (34.24)   |       |
| Former smoker                | 678 (19.84)   | 109 (16.82) | 569 (20.55)   |       |
| Number of comorbidities      |               |             |               |       |
| 0                            | 1,790 (52.39) | 294 (45.37) | 1,496 (54.03) | 0.000 |
| 1                            | 955 (27.95)   | 197 (30.40) | 758 (27.37)   |       |
| ≥2                           | 672 (19.67)   | 157 (24.23) | 515 (18.60)   |       |
| Overall health condition     |               |             |               |       |
| Fair or poor                 | 770 (22.53)   | 205 (31.64) | 565 (20.40)   | 0.000 |
| Good, very good or excellent | 2,647 (77.47) | 443 (68.36) | 2,204 (79.60) |       |

Table 1 – Replication (cont.)

# Analysis of Demographics Table (Table 1)

- A total of 3417 participants were included in our study after selection criteria process.
  - 81.04% of participants qualified as having had cervical cancer screening, where as ~19% of the participants had no cervical cancer screening
  - The majority of participants in our analysis are white (n=2544, 74.45%)
- Chi-Squared Test Interpretations
  - Concurrently with the results of the original study, women with cervical cancer screening tended to be younger, completed higher levels of education, more likely to complete regular physical exercise, be non-current smokers, have lower number of comorbidities, and have better overall health status
    - Evaluated based on the threshold of  $\alpha = 0.05$
  - No evidence suggesting marital status, obesity, and alcohol consumption were distributed differently across screening history
- Differences to the original study
  - Differences in cell counts and p-values, but conclusions were similar to original study

**Table 2** Associations of healthcare access and HIV test with cervical cancer screening in women at a high risk of HIV infection

| Factors                            | Overall distribution<br>n (%) | Cervical cancer screening<br>percentage and 95% CI | cOR and 95% CI<br>(n=3448) | aOR and 95% CI†<br>(n=3448) |
|------------------------------------|-------------------------------|----------------------------------------------------|----------------------------|-----------------------------|
| Last clinical check-up*            |                               |                                                    |                            |                             |
| <1 year ago (REF)                  | 2347 (68.1)                   | 88.9 (87.6 to 90.1)                                | 1                          | 1                           |
| 1–<2 years ago                     | 502 (14.6)                    | 86.3 (83.0 to 89.0)                                | 0.78 (0.59 to 1.04)        | 0.74 (0.54 to 1.00)         |
| 2–<5 years ago                     | 298 (8.6)                     | 72.5 (67.1 to 77.3)                                | 0.33 (0.25 to 0.44)        | 0.31 (0.23 to 0.43)         |
| ≥5 years ago                       | 301 (8.7)                     | 58.1 (52.5 to 63.6)                                | 0.17 (0.13 to 0.23)        | 0.19 (0.14 to 0.26)         |
| Had personal healthcare provider   |                               |                                                    |                            |                             |
| Yes (REF)                          | 2671 (77.5)                   | 86.4 (85.0 to 87.6)                                | 1                          | 1                           |
| No                                 | 777 (22.5)                    | 77.7 (74.7 to 80.5)                                | 0.55 (0.45 to 0.67)        | 0.93 (0.72 to 1.20)         |
| Had healthcare coverage            |                               |                                                    |                            |                             |
| Yes (REF)                          | 3013 (87.4)                   | 86.5 (85.2 to 87.6)                                | 1                          | 1                           |
| No                                 | 435 (12.6)                    | 70.3 (65.9 to 74.5)                                | 0.37 (0.29 to 0.47)        | 0.60 (0.46 to 0.79)         |
| Had HIV test                       |                               |                                                    |                            |                             |
| Had test within last year<br>(REF) | 1215 (35.2)                   | 90.6 (88.8 to 92.1)                                | 1                          | 1                           |
| Had test over 1 year ago           | 1202 (34.9)                   | 83.8 (81.6 to 85.8)                                | 0.53 (0.42 to 0.68)        | 0.64 (0.49 to 0.84)         |
| Had no test                        | 1031 (29.9)                   | 77.9 (75.2 to 80.3)                                | 0.36 (0.29 to 0.46)        | 0.46 (0.35 to 0.61)         |

Table 2 – Original

| <b>Factors</b>                          | <b>distribution<br/>n (%)</b> | <b>Cervical cancer screening<br/>percentage and 95% CI</b> | <b>cOR and 95% CI<br/>(n=3417)</b> | <b>aOR and 95% CI<br/>(n=3417)</b> |
|-----------------------------------------|-------------------------------|------------------------------------------------------------|------------------------------------|------------------------------------|
| <b>Last clinical check-up</b>           |                               |                                                            |                                    |                                    |
| <1 year ago (REF)                       | 2,335 (68.33)                 | 83.51                                                      | 1                                  | 1                                  |
| 1–<2 years ago                          | 498 (14.57)                   | 85.74                                                      | 1.2 (0.9–1.7)                      | 1.12 (0.83–1.49)                   |
| 2–<5 years ago                          | 296 (8.66)                    | 77.03                                                      | 0.7 (0.5–1.0)                      | 0.63 (0.46–0.87)                   |
| ≥5 years ago                            | 288 (8.43)                    | 56.94                                                      | 0.3 (0.2–0.4)                      | 0.25 (0.18–0.33)                   |
| <b>Had personal healthcare provider</b> |                               |                                                            |                                    |                                    |
| Yes (REF)                               | 2,674 (78.26)                 | 82.42                                                      | 1                                  | 1                                  |
| No                                      | 743 (21.74)                   | 76.04                                                      | 0.96 (0.76–1.20)                   | 0.86 (0.67–1.09)                   |
| <b>Had healthcare coverage</b>          |                               |                                                            |                                    |                                    |
| Yes (REF)                               | 3,028 (88.62)                 | 82.20                                                      | 1                                  | 1                                  |
| No                                      | 389 (11.38)                   | 71.98                                                      | 0.77 (0.58–1.01)                   | 0.88 (0.67–1.17)                   |
| <b>Had HIV test</b>                     |                               |                                                            |                                    |                                    |
| Did have HIV test                       | 2,412 (72.28)                 | 83.58                                                      | 1                                  | 1                                  |
| Did not have HIV test                   | 925 (27.72)                   | 75.35                                                      | 0.6 (0.5–0.7)                      | 0.67 (0.55–0.82)                   |

Table 2 – Replication

# Healthcare Access and HIV testing associations

Stata Code for building Multivariable Regression Models:

```
*Crude OR & 95% CI
logit cervical provider hlthcvg hivtest i.clinicalcheck, or

*Adjusted OR & 95% CI
logit cervical provider hlthcvg hivtest i.clinicalcheck agecat race education married bmi actexc funperson smoker illness healthcond, or
```

- Similar distributions of cancer screening percentages across the factors to the original study
- Odds Ratios and Confidence Intervals
  - Many of the 95% confidence intervals for the odds ratios included the value of 1, thus many of the odds ratio lack significance
  - Major differences in ORs and confidence intervals as opposed to the original study
    - Healthcare Coverage
    - Difference in categories for HIV testing (binary variables vs 3-level categorical variable)
      - To what degree did this affect or change our regression model?
- Conclusions regarding clinical check up time and HIV testing

**Table 3** Associations of healthcare access and HIV test with cervical cancer screening in subgroups defined by education

|                                  | Less than college level (n=2185) |                     | At or above college level (n=1263) |                     |                |
|----------------------------------|----------------------------------|---------------------|------------------------------------|---------------------|----------------|
| Factors                          | n (%)                            | aOR and 95% CI      | n (%)                              | aOR and 95% CI      | P interaction† |
| Last clinical check-up*          |                                  |                     |                                    |                     |                |
| <1 year ago (REF)                | 1475 (67.5)                      | 1                   | 872 (69.0)                         | 1                   | 0.04           |
| 1–<2 years ago                   | 297 (13.6)                       | 0.86 (0.60 to 1.24) | 205 (16.2)                         | 0.51 (0.29 to 0.89) |                |
| 2–<5 years ago                   | 199 (9.1)                        | 0.39 (0.27 to 0.57) | 99 (7.8)                           | 0.19 (0.10 to 0.33) |                |
| ≥5 years ago                     | 214 (9.8)                        | 0.18 (0.12 to 0.25) | 87 (6.9)                           | 0.22 (0.11 to 0.42) |                |
| Had personal healthcare provider |                                  |                     |                                    |                     |                |
| Yes (REF)                        | 1661 (76.0)                      | 1                   | 1010 (80.0)                        | 1                   | 0.47           |
| No                               | 524 (24.0)                       | 0.98 (0.73 to 1.32) | 253 (20.0)                         | 0.78 (0.48 to 1.27) |                |
| Had healthcare coverage          |                                  |                     |                                    |                     |                |
| Yes (REF)                        | 1835 (84.0)                      | 1                   | 1178 (93.3)                        | 1                   | 0.84           |
| No                               | 350 (16.0)                       | 0.58 (0.42 to 0.78) | 85 (6.7)                           | 0.59 (0.30 to 1.15) |                |
| Had HIV test                     |                                  |                     |                                    |                     |                |
| Had test within last year (REF)  | 818 (37.4)                       | 1                   | 397 (31.4)                         | 1                   | 0.59           |
| Had test over 1 year ago         | 731 (33.5)                       | 0.62 (0.45 to 0.84) | 471 (37.3)                         | 0.73 (0.41 to 1.31) |                |
| Had no test                      | 636 (29.1)                       | 0.48 (0.35 to 0.66) | 395 (31.3)                         | 0.43 (0.24 to 0.77) |                |

|                                  | Less than college level (n= 2,144) |                  | At or above college level (n= 1,273) |                  |
|----------------------------------|------------------------------------|------------------|--------------------------------------|------------------|
| Factors                          | n (%)                              | aOR and 95% CI   | n (%)                                | aOR and 95% CI   |
| Last clinical check-up           |                                    |                  |                                      |                  |
| <1 year ago (REF)                | 1,452 (67.72)                      | 1                | 883 (69.36)                          | 1                |
| 1–<2 years ago                   | 296 (13.81)                        | 1.23 (0.86–1.76) | 202 (15.87)                          | 0.94 (0.58–1.55) |
| 2–<5 years ago                   | 195 (9.10)                         | 0.70 (0.48–1.04) | 101 (7.93)                           | 0.51 (0.29–0.91) |
| ≥5 years ago                     | 201 (9.38)                         | 0.23 (0.16–0.33) | 87 (6.83)                            | 0.28 (0.16–0.50) |
| Had personal healthcare provider |                                    |                  |                                      |                  |
| Yes (REF)                        | 1,652 (77.05)                      | 1                | 1,022 (80.28)                        | 1                |
| No                               | 492 (22.95)                        | 0.82 (0.61–1.10) | 251 (19.72)                          | 0.92 (0.60–1.43) |
| Had healthcare coverage          |                                    |                  |                                      |                  |
| Yes (REF)                        | 1,833 (85.49)                      | 1                | 1,195 (93.87)                        | 1                |
| No                               | 311 (14.51)                        | 0.86 (0.63–1.18) | 78 (6.13)                            | 0.92 (0.48–1.79) |
| Had HIV test                     |                                    |                  |                                      |                  |
| Did have HIV test                | 1,540 (73.54)                      | 1                | 872 (70.15)                          | 1                |
| Did not have HIV test            | 554 (26.46)                        | 0.70 (0.55–0.89) | 371 (29.85)                          | 0.62 (0.43–0.89) |

Table 3 - Replication

# Healthcare Access/HIV Test in education subgroups

Stata Code for Regression Models:

```
*Adjusted OR & 95% CI for less than college level  
logit cervical provider hlthcvg hivtest i.clinicalcheck agecat race married bmi actexc funperson smoker illness healthcond if education2==0, or
```

```
*Adjusted OR & 95% CI for at or above college level  
logit cervical provider hlthcvg hivtest i.clinicalcheck agecat race married bmi actexc funperson smoker illness healthcond if education2==1, or
```

- HIV testing
  - Those who did not have an HIV test had lower odds of having gotten cervical cancer screening across both education subgroups
    - Value of 1 does not fall within 95% CI, thus significant odds ratio
  - Conclusions similar to models that did not adjust for education
- Comparing to Original Study
  - Similar distributions of cancer screening within each education subgroup across factors
  - However, major differences in value and significance of Odds Ratio
    - Clinical Checkup
    - Healthcare Coverage

# Discussion and Limitations

- Conclusions garnered from results:
  - Lack of HIV testing and delayed clinical check-ups were inversely associated with cervical cancer screening
  - Differences in conclusion from original study
- Through building comprehensive logistic regression models we found that the demographic variables were influential when adjusted for in the model
  - Moreover, for specific demographic characteristics there were difference in cervical cancer screening percentages, based on the chi-squared values
    - I.e education, smoker status, and more
  - Logistic models did not convey high predictive accuracy either given the lack of significance for many of the predictors in the model
- We expanded upon the study by adjusting for income in our regression models
  - Income did not have significant influence on the factors, not were there significant interaction effects
- Limitations
  - Obstacles regarding variable building
    - Lack of transparency regarding certain variables by the authors
- Future Recommendations

# Work Cited

Zhang D, Advani S, Huchko M, Braithwaite D. *Impact of healthcare access and HIV testing on utilisation of cervical cancer screening among US women at high risk of HIV infection: cross-sectional analysis of 2016 BRFSS data*. BMJ Open. 2020 Jan 6;10(1):e031823. doi: 10.1136/bmjopen-2019-031823. PMID: 31911515; PMCID: PMC6955489.