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Comparison of Compliance with Cervical Cancer Screening among Women aged 18 and above in Arkansas and the United States

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ABSTRACT

Introduction: Cervical cancer affects women without access to preventative screening at higher rates. Any woman who has developed an invasive case of cervical cancer should be regarded as a failure of screening. Disparities in access to screening, triage, and treatment fuel an uneven distribution in the burden of cervical cancer within the United States; especially in southern states like Arkansas. The purpose of this study was to evaluate demographic and behavioral risk factors for cervical cancer and identify potential barriers which may influence the likelihood of complying with current Pap test recommendations nationally and in Arkansas.

Materials and Methods: Data from the 2014 Behavioral Risk Factor Survey System (BRFSS) was used to describe demographic characteristics and behavioral risk factors among 1,587 females in Arkansas and 162,222 in the United States aged 18 and above who were eligible to receive Pap tests. Women with a medical history of hysterectomy that included the removal of the cervix were excluded from analysis because they are not considered to be medically eligible to receive Pap tests.

Results: Socioeconomic status, age, race, and health insurance were significantly associated with the likelihood to comply with current screening recommendations among women in both Arkansas and the United States. Arkansan women who had less than a 12-year education (Odds Ratio (OR) = 1.41, 95% Confidence Interval (CI) = 1.04, 1.64) and were without health insurance (OR = 3.56, 95% CI = 1.66, 7.66) were more likely to be non-compliant with Pap testing, which was similar to the finding on the national level. The prevalence of Pap test compliance was significantly lower among women in Arkansas when compared to the national average in every sociodemographic sector.

Discussion: According to United States Census data collected in 2013, Arkansas had the highest cervical cancer incidence of 10.6 per 100,000 person-years, while the national average was

7.7 per 100,000 person-years. Therefore, future population-based cervical cancer interventions in Arkansas should target the promotion of Pap test compliance among women of minority populations, with low socioeconomic status, and who are medically under or uninsured. Organized screening interventions might include offering free or reduced cost Pap testing in both urban and rural locations.

Keywords: Cervical cancer; screening; Pap test; disparities; Arkansas

INTRODUCTION

Ranked globally as the fourth most common female malignancy, cervical cancer (CC) is undoubtedly a global public health concern (Kessler, 2017). The global incidence of CC is an estimated 527,624 new cases annually with 265,672 deaths as a result (Bruni, 2016). CC is the third most common cause of death worldwide for women who live in low-resource or less developed countries (Kessler, 2017). Women who are poor and live in rural areas of low and middle-income countries, as well as women who are poor and live in high-income countries, are at an increased risk of developing invasive CC (Kessler, 2017). In the United States (US), benefits of early detection have not been shared equally by all segments of the population. Racial and socioeconomic disparities exist in CC incidence and mortality rates (Garner, 2003). Low income and minority women are more likely to be diagnosed at later stages and have higher mortality rates (Garner, 2003). Cervical cancer is a preventable disease and any female presenting with invasive CC should be viewed as a failure of screening (Garner, 2003).

Etiology

Globally, more than 80% of sexually active individuals acquire genital Human Papillomavirus (HPV) infections (Phillip, 2018). In the US, an estimated 6.2 million persons will acquire a new HPV infection annually (Phillip, 2018). Infection by high-risk HPV types or strains is necessary but not sufficient for the development of CC (Walboomers, 1999). In the US, HPV is detected in 99.7% of cervical cancers (McCormack, 2014). The average number of HPV-attributable cases of CC per year is 11,693 (CDC, 2017). Over 120 types of HPV have been identified, and approximately one-third of these infect the squamous epithelia of the genital tract (Moody, 2010). Of the genital strains of HPV, which are sexually transmitted, 15 are categorized as carcinogenic or high-risk and are considered the causative agents of most cervical cancers (Moody, 2010). About 70% of cervical cancers are the result of persistent infection with at least one high-risk strain of HPV (Moody, 2010). In cells persistently infected with HPV, cellular mutations accumulate over time, and the infection consequently develops into cancer. Prophylactic vaccination is the most effective method of prevention against initial infection of high-risk types of HPV (Kessler, 2017; Moody, 2010). However effective, the vaccine cannot protect individuals against pre-existing infections, nor do they protect against every type of HPV (Kessler, 2017). Thus, women vaccinated or not are encouraged to adhere to CC screening guidelines.

Risk Factors

Persistent infection with a high-risk HPV strain is the principal risk factor for the development of CC. The major risk factor for HPV infection is sexual behavior, including early age at onset of sexual activity, multiple sexual partners, failure to use barrier methods of contraception, and co-infection with other sexually transmitted diseases (Moody, 2010).

Furthermore, studies have suggested an association between tobacco use and the development of CC. Women who smoke cigarettes are twice as likely to develop CC compared

with non-smokers (American Cancer Society, 2015). Cigarette smoking has also been suggested to increase the risk of HPV-associated malignant transformation (Kanetsky, 1998). Having a family history of CC can increase risk by two to three times higher than those with no family history (American Cancer Society, 2015). Other studies have suggested that micronutrient deficiencies, such as low vitamin c and carotenoid status may contribute to the progression of the HPV-induced changes in the cervical epithelium (Potischman, 1996; Weinstein, 2001). Lastly, late stage at diagnosis has been identified as the major cause of excess morbidity and mortality in low socioeconomic status (SES) and medically under or uninsured populations. Late stage at diagnosis is the final result of complex interactions between multiple risk factors, including disparities in access to screening, diagnosis, and treatment (Garner, 2003).

Screening

Reducing the burden of CC is contingent on primary prevention and early detection. Early detection via screening allows time for a medical intervention on precancerous or cancerous lesions before the malignant cells invade surrounding tissues (Phillip, 2018). Cervical cancer screening by way of Papanicolaou cytology testing (Pap test, Pap smear) is well integrated into the US health care system and is widely accepted by women (Tiro, 2007). When Pap test results are determined to be abnormal, a colposcopy assessment will be completed, followed by biopsies of high-grade lesions, and finally, treatment of biopsy-proven high-grade lesions (Phillip, 2018). Women with precancerous lesions who are treated have nearly a 100% 5-year survival rate (Kessler, 2017; Walboomers, 1999). The process of screening, triage, and treatment is cumbersome, and noncompliance at any point renders this process ineffective (Phillip, 2018). In the US, screening is opportunistic: generally, women are tested when they present for care, usually at annual visits; thus, not all women receive the recommended screening nor receive the screening in a timely manner (Kessler, 2017, Phillip, 2018).

Current Recommendations

Currently, the United States Preventive Task Force (USPTF) recommends a Pap test once every three years for women aged 21 to 65 (USPTF, 2015). As an alternative, women aged 30 to 65 who wish to be screened less regularly may choose the combination of cytology and HPV testing once every five years (USPTF, 2015). These recommendations apply to women, irrespective of sexual history, who have a cervix and display no signs or symptoms of CC (USPTF, 2015). After completing a potential harm to benefit analysis, the USPTF recommends against the screening of women who have had a hysterectomy with removal of the cervix, women younger than 21, or women older than age 65 who have a history of being adequately screened (USPTF, 2015). According to a Centers for Disease Control and Prevention Morbidity and Mortality Weekly Report published in 2015, the percentage of women in the US receiving the recommended screening was only 80%, and the rate was declining (White, 2015). In response, a Healthy People 2020 cancer-related objective is to increase the proportion of women aged 21 to 65 who receive a screening based on the most recent guidelines to 93% (HP2020, 2010).

Disparities in Burden

The American Cancer Society projected 12,820 new cases of invasive CC to be diagnosed with 4,210 resultant deaths in the US in 2017 (American Cancer Society, 2016). Cervical cancer remains 14th in frequency among all cancers, and the southern states have disproportionately high CC incidence and mortality rates (Kessler, 2017; NIH, 2013). This suggests that not all sectors of the US population have shared the benefits of early CC detection via Pap test screening equally.

In 2013, Arkansas (AR) had one of the highest cervical cancer incidences of 9.9 per 100,000 person-year, while the national average was 8.2 per 100,000 person-year (CDC, 2016). The total population in AR includes several subpopulations which are traditionally underrepresented in well-established cohorts (Bondurant, 2011). Rural, minority and lower socioeconomic communities exist both in combination and separately within the state (Bondurant, 2011). According to 2017 census population estimates, of the total population, 42% lived in a rural community, 15.7% were African American, and 17.2% of Arkansans lived in poverty (US Census, 2017).

Disparities in the burden of CC are exposed when comparing incidence and mortality rates regarding education, income and occupation, otherwise known as socioeconomic status. Congruently, the National Health Interview Survey showed that income and education are better predictors of screening compliance than race (Breen & Kessler, 1994). The purpose of this study was to assess demographic and behavioral risk factors for CC and to identify potential barriers which influence the likelihood of complying with current Pap test recommendations.

METHODS

Study Design and Population

The Behavioral Risk Factor Surveillance System (BRFSS) is the nation's premier system of health-related telephone surveys that collect state-level data about residents regarding their health-related risk behaviors, chronic health conditions and use of preventative services (BRFSS, 2014). Our randomized sampling from the most substantial continuously conducted health survey is more representative of AR and US populations when compared to previous relevant literature (Blackwell et al., 2008, Hiatt et al., 2001, CDC, 2014).

National data from the 2014 BRFSS was used for both sociodemographic characteristics and behavioral risk factors among female participants in AR and the US. BFRSS data included a total of 1,587 women in AR and 162,222 in the US who were aged 18 and above and eligible to receive Pap tests. Women with a medical history of hysterectomy that included removal of the cervix were considered not eligible to receive Pap tests and subsequently excluded from analysis.

During the survey, participants were asked,

> *"Have you not had a Pap test in the past three years?"*
>
> to which they either responded,
>
> *"No, I have had a Pap test in the past three years."*
>
> or
>
> *"Yes, I have not had a Pap test in the past three years."*

For this study, "compliant" women reported that they have had a Pap test in the past three years while "non-compliant" women reported that they had not. We examined compliance with Pap test screening by age group, race (White, Black, Asian and Others), household income, education (<=12-year education versus >12-year education), health insurance coverage, marital status, body mass index (BMI), smoking status (current, former, or never), heavy drinker (yes

versus no), and public health region of residence (Central, Northeast, Southeast, Southwest, or Northwest).

Statistical Analysis

Weighted frequencies of demographic and behavioral risk factors were used in this analysis. Bivariate analysis was conducted to explore the associations between demographic and behavioral risk factors and compliant versus non-compliant with Pap testing among women in AR and the US. Multivariate logistic regression was performed to identify risk factors for non-compliance with Pap test recommendations by controlling for potential confounding variables that were determined by *a priori* and causal graphs. All analyses were performed in Stata 14.0 (StataCorp LP, College Station, Texas, USA).

RESULTS

Demographics and behavioral characteristics of women in AR and the US

Of 1,587 women aged 18 and above in AR, the majority were aged 45 years old or older (74%), White (78%), had an average household income of less than $50,000 per year (73%), had health care insurance (90%), received more than 12 years of education (55%), overweight or obese (60%), a current or former smoker (76%), a heavy drinker (95%), and lived in an urban area (58%) (Table 1).

Table 1	**Demographics and Behavioral Characteristics of Women in Arkansas**						
	Have had Pap test (Compliant)			Have not had Pap test (Non-compliant)			*P-value**
	N=1,126	Percentage (%)	Weighted Percentage (%)	N=461	Percentage (%)	Weighted Percentage (%)	
Age group							<0.001
18-24	40	87.0	84.5	6	13.0	15.3	
25-34	156	91.2	87.1	15	8.8	12.7	
35-44	161	82.6	81.1	34	17.4	18.9	
45-54	212	82.5	79.5	45	17.5	20.5	
55-64	229	72.0	68.6	89	28.0	31.4	
65 or older	328	54.7	56.6	272	45.3	43.4	
Race							0.02
White	847	68.4	75.0	392	31.6	25.0	
Black	196	82.4	90.4	42	17.6	9.6	
Asian	36	90.0	84.4	4	10.0	15.6	
others	47	67.1	68.1	23	32.9	31.9	
Household income							0.004
>$50,000	363	83.8	87.2	70	16.2	12.8	
$35,000-$50,000	142	76.8	79.9	43	23.2	20.1	
$25,000-$35,000	116	62.4	73.2	70	37.6	26.8	
$15,000-$25,000	197	65.9	75.1	102	34.1	24.9	
<$15,000	137	60.9	69.3	88	39.1	30.7	
Education							<0.001
<= 12-year education	453	63.5	70.3	260	36.5	29.7	
>12-year education	669	77.0	84.2	200	23.0	15.8	
Health care insurance							0.001
Yes	1025	71.4	79.4	410	28.6	20.6	
No	95	66.4	66.9	48	33.6	33.1	
Marital status							0.08
Married	589	76.8	79.7	178	23.2	20.3	
Divorced/widowed/separated	383	61.6	69.1	239	38.4	30.9	
Never Married	125	79.1	83.1	33	20.9	16.9	
Unmarried couple	22	73.3	76.7	8	26.7	23.3	
BMI							0.98
Underweight (BMI<18.5)	20	58.8	75.9	14	41.2	24.1	
Normal (18.5-25)	344	67.7	76.6	164	32.3	23.4	
Overweight (25-30)	325	72.4	78.2	124	27.6	21.8	
Obese (>30)	367	73.3	77.6	134	26.7	22.4	
Smoking status							<0.001
Current smoker	681	75.0	84.0	227	25.0	16.0	
Former smoker	192	64.6	64.5	105	35.4	35.5	
Never smoked	248	66.7	75.4	124	33.3	24.6	
Heavy drinker							<0.001
Yes	1,064	70.5	77.1	445	29.5	22.9	
No	50	78.1	80.3	14	21.9	19.7	
Public health regions							0.01
Central	310	78.9	83.5	83	21.1	16.5	
Northeast	166	64.8	73.6	90	35.2	26.4	
Southeast	136	70.1	77.0	58	29.9	23.0	
Southwest	100	58.1	81.3	72	41.9	18.7	
Northwest	362	71.3	64.8	146	28.7	35.2	
**P-values* were corrected for weights.							

Table 2	Risk Factors for non-compliance among women in Arkansas		
	Odds ratios (95% confidence interval [CI])* in Arkansas		
	Point estimate	Lower Band of 95% CI	Upper Band of 95% CI
Age group			
18-24	Ref	Ref	Ref
25-34	0.68	0.17	2.79
35-44	2.07	0.48	8.81
45-54	2.22	0.54	9.10
55-64	5.10	1.28	20.28
65 or older	11.06	2.93	41.84
Race			
White	Ref	Ref	Ref
Black	0.12	0.04	0.32
Asian	0.26	0.04	1.76
others	2.15	0.84	5.50
Household income			
>$50,000	Ref	Ref	Ref
$35,000-$50,000	0.85	0.39	1.88
$25,000-$35,000	1.59	0.83	3.05
$15,000-$25,000	1.21	0.56	2.63
<$15,000	1.89	0.84	4.24
Education			
<= 12-year education	Ref	Ref	Ref
>12-year education	0.59	0.36	0.96
Health care insurance			
Yes	Ref	Ref	Ref
No	3.56	1.66	7.66
Marital status			
Married	Ref	Ref	Ref
Divorced/widowed/separated	0.92	0.54	1.57
Never Married	1.67	0.57	4.87
Unmarried couple	0.77	0.12	5.20
BMI			
Normal (18.5-25)	Ref	Ref	Ref
Underweight (BMI<18.5)	1.10	0.37	3.26
Overweight (25-30)	0.90	0.51	1.57
Obese (>30)	1.09	0.63	1.88
Smoking status			
Never smoked	Ref	Ref	Ref
Current smoker	3.96	2.25	6.94
Former smoker	1.06	0.67	1.68
Heavy drinker			
Yes	Ref	Ref	Ref
No	0.72	0.25	2.13
Public health regions			
Central	Ref	Ref	Ref
Northeast	1.03	0.47	2.25
Southeast	1.23	0.47	3.24
Southwest	1.86	0.93	3.72
Northwest	0.99	0.53	1.86
*Odds ratios were corrected for weights.			

Women who were non-compliant with Pap testing were more likely to be older, White, less educated, uninsured, and a current or former smoker, a heavy drinker, have a lower household income and live in rural area. The demographic characteristics in the national survey were similar to those in AR (Table 3).

Table 3	**Demographics and Behavioral Characteristics of Women in United States**						
	Have had Pap test (Compliant)			Have not had Pap test (Non-compliant)			*P-value**
	N=127,327	Percentage (%)	Weighted Percentage (%)	N=34,895	Percentage (%)	Weighted Percentage (%)	
Age group							<0.001
18-24	5483	95.1	95.3	282	4.9	4.7	
25-34	17358	91.8	92.3	1548	8.2	7.7	
35-44	21848	88.6	88.8	2821	11.4	11.2	
45-54	26113	85.4	86.6	4457	14.6	13.4	
55-64	30173	81.1	81.3	7052	18.9	18.7	
65 or older	26352	58.4	61.1	18735	41.6	38.9	
Race							<0.001
White	97,647	76.7	81.9	29649	23.3	18.1	
Black	10849	87.2	90.3	1588	12.8	9.7	
Asian	11192	85.4	88.6	1919	14.6	11.4	
others	7639	81.5	86.3	1739	18.5	13.7	
Household income							0.001
>$50,000	57017	87.2	89.7	8360	12.8	10.3	
$35,000-$50,000	15718	78.0	83.7	4424	22.0	16.3	
$25,000-$35,000	11,018	72.2	79.7	4238	27.8	20.3	
$15,000-$25,000	16229	69.1	79.8	7258	30.9	20.2	
<$15,000	11124	70.0	79.0	4775	30.0	21.0	
Education							<0.001
<= 12-year education	36,554	71.5	79.5	14,551	28.5	20.5	
>12-year education	90,505	81.7	87.0	20,245	18.3	13.0	
Health care insurance							0.001
Yes	118164	79.3	85.3	30919	20.7	14.7	
No	8912	69.6	77.3	3885	30.4	22.7	
Marital status							0.08
Married	71823	83.5	86.3	14167	16.5	13.7	
Divorced/widowed/separated	32572	66.7	73.3	16238	33.3	26.7	
Never Married	18204	83.5	89.5	3601	16.5	10.5	
Unmarried couple	4065	85.5	89.3	692	14.5	10.7	
BMI							<0.001
Underweight (BMI<18.5)	2,235	69.4	80.7	987	30.6	19.3	
Normal (18.5-25)	47604	79.7	85.6	12154	20.3	14.4	
Overweight (25-30)	36503	78.5	84.4	9993	21.5	15.6	
Obese (>30)	32981	77.4	82.5	9609	22.6	17.5	
Smoking status							<0.001
Current smoker	79792	81.3	87.1	18305	18.7	12.9	
Former smoker	17144	73.3	78.3	6257	26.7	21.7	
Never smoked	29833	74.6	80.1	10134	25.4	19.9	
Heavy drinker							<0.001
Yes	118,055	78.4	84.2	32589	21.6	15.8	
No	7425	80.7	84.5	1778	19.3	15.5	
Public health regions							<0.001
Northeast	25923	81.1	85.7	6,060	18.9	14.3	
Midwest	33947	76.9	82.8	10197	23.1	17.2	
South	36893	79.8	84.3	9336	20.2	15.7	
West	27817	76.1	84.3	8,734	23.9	15.7	
**P-values* were corrected for weights.							

Risk factors for non-compliance among women in AR and the US

Tables 2 and 4 present results from multivariable logistic regression. The odds of non-compliance with Pap testing increased along with age in the national survey (Table 4). Among women in AR, women aged 65 and older were most likely to be non-compliant with Pap testing (adjusted Odds Ratio (aOR) 11.06, 95% confidence interval (CI) 2.93-41.84). Black women were

88% (aOR 0.12, 95% CI 0.04-0.32) and 56% (aOR 0.44, 95% CI 0.39-0.51) more likely to have had a Pap test in the past three years compared to their White counterparts in AR and the US, respectively. A similar finding was also observed among Asians.

Table 4	**Risk factors for non-compliance among women in United States**		
	Odds ratios (95% confidence interval [CI])* in the US		
	Point estimate	Lower Band of 95% CI	Upper Band of 95% CI
Age group			
18-24	Ref	Ref	Ref
25-34	1.84	1.44	2.35
35-44	3.57	2.80	4.56
45-54	4.33	3.40	5.51
55-64	6.68	5.25	8.50
65 or older	19.31	15.16	24.58
Race			
White	Ref	Ref	Ref
Black	0.44	0.39	0.51
Asian	0.47	0.41	0.54
others	0.84	0.69	1.03
Household income			
>$50,000	Ref	Ref	Ref
$35,000-$50,000	1.38	1.25	1.52
$25,000-$35,000	1.76	1.57	1.96
$15,000-$25,000	1.75	1.57	1.95
<$15,000	1.99	1.76	2.25
Education			
<= 12-year education	Ref	Ref	Ref
>12-year education	0.87	0.80	0.93
Health care insurance			
Yes	Ref	Ref	Ref
No	2.78	2.51	3.08
Marital status			
Married	Ref	Ref	Ref
Divorced/widowed/separated	1.18	1.09	1.27
Never Married	1.18	1.06	1.32
Unmarried couple	1.00	0.83	1.21
BMI			
Normal (18.5-25)	Ref	Ref	Ref
Underweight (BMI<18.5)	1.23	1.02	1.49
Overweight (25-30)	0.97	0.90	1.05
Obese (>30)	1.20	1.11	1.30
Smoking status			
Never smoked	Ref	Ref	Ref
Current smoker	1.77	1.63	1.92
Former smoker	1.13	1.05	1.22
Heavy drinker			
Yes	Ref	Ref	Ref
No	1.09	0.97	1.23
Public health regions			
Northeast	Ref	Ref	Ref
Midwest	1.29	1.18	1.41
South	1.25	1.15	1.36
West	1.31	1.17	1.45
*Odds ratios were corrected for weights.			

An inverse trend in the odds of non-compliance with Pap testing was observed along with decreased household income in the national survey. Women with a household income of less than $15,000 were most likely not to have had a Pap test in the past three years (aOR 1.99, 95% CI

1.76-2.25). In AR, a similar pattern was found with an exception that women with a household income of $35,000-$50,000. Women with more than 12 years of education were 41% (aOR 0.59, 95% CI 0.36-0.96) and 13% (aOR 0.87, 95% CI 0.80-0.93) more likely to have a Pap test in the past three years in AR and the US, respectively.

Uninsured women were approximately two times more likely to not comply with Pap testing in AR (aOR 3.56, 95% CI 1.66-7.66) and the US (aOR 2.78, 95% CI 2.51-3.08) than women with insurance. The association of current tobacco smokers and non-compliance with Pap testing in AR (aOR 3.96, 95% CI 2.25-6.94) was stronger than that in the US (aOR 1.77, 95% CI 1.63-1.92).

DISCUSSION

Numerous studies have shown that most women who develop CC in developed countries, especially those presenting at advanced stages, are inadequately screened (Phillip, 2018). Researchers have suggested SES, age, race, and access to medical insurance facilitate or contrarily, limit compliance with recommended screening for CC. Both Krieger *et al.* (1999) and Liu *et al.* (1998) reported SES as inversely associated with cervical cancer incidence. Krieger *et al.* (1999) reported CC incidence rates varied as much by SES than by race and ethnicity. Our results were in agreement with these studies as our results included household income and education, both components of SES, exhibited strong associations with likeliness to comply with Pap testing. Women who lived in households with an average income of less than $15,000 were the least likely to receive regular Pap tests. It is likely that these women do not qualify for and cannot afford quality health insurance which would cover the cost of screening.

Similar to our study design, D.L. Blackwell *et al.* (2008) examined compliance with current national Pap test guidelines among US and Canadian women. Investigators found that younger age was strongly associated with the odds of having a Pap test. The odds of having a Pap test were lower among older women relative to women aged 18 to 29. Our results among women in AR suggest a similar pattern of compliance being inversely associated with age. Although the current guidelines recommend against screening past the age of 65 (USPTF, 2015), this recommendation is contingent on having a personal history of adequate screening or having had a hysterectomy.

Additionally, Blackwell *et al.* (2008) reported non-Hispanic black women in the US were more likely to be compliant with Pap testing guidelines than non-Hispanic white women. Our results were in agreement. Surprisingly, though, Black women in some areas of the US have higher screening Pap test rates (Makuc, 1989), but are still diagnosed in later stages and have higher mortality than their white counterparts. This is possibly due to inadequate follow-up systems for women who have received abnormal Pap test results. Furthermore, system-level barriers exist beyond inadequate follow-up recommendations. The quality of health care being received, perceived racism and discrimination, medical mistrust, and a lack of culturally sensitive, linguistically appropriate educational interventions create barriers throughout the process of screening, follow-up, and treatment.

Lastly, our results presented medical insurance as a significant barrier to compliance with Pap testing. Several studies have reported that medically under or uninsured women have lower cancer screening rates and often present at later stages of the disease (Garner, 2003). Hiatt *et al.* (2001) found that the strongest predictors of cancer screening were having private health insurance and frequent use of medical services.

Arkansas has the second highest cervical cancer incidence and mortality rate among all states in the US (CDC, 2016). It is not surprising to see that there is a significant disparity in Pap test compliance among women in AR in every sociodemographic sector when compared to the US average. Income and education are significant barriers for Pap test compliance in AR, which is consistent with the finding in the US.

CONCLUSION

Future cervical cancer screening interventions in AR should target the promotion of Pap test compliance among women of color, with low SES, and the medically under or uninsured. Linguistically-appropriate educational interventions should be employed inside high-risk communities and should inform about what CC is, associated risk factors, current screening guidelines, and what a Pap test is and involves. Reduced or no-cost Pap testing clinics in such communities would provide medical professionals with a platform for educating patients. Furthermore, taking the reduced or no-cost Pap testing opportunity to women who live in rural areas by way of a mobile unit would decrease barriers to compliance often posed by geographical distance and transportation. The prospective benefits of culturally-competent educational interventions include decreasing the stigma associated with HPV infection and increasing knowledge of the potentially lifesaving importance of receiving a Pap test once every three years.

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