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Trends of Endometrial Cancer among Adult Women in the United States

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Capstone Paper

Title: Trends of Endometrial Cancer among Adult Women in the United States.

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Abstract

Background: Endometrial cancer also referred to as uterine corpus cancer is the fourth most common cancer diagnosed among US women. It is also one of the few cancers in the US that has an increasing incidence and mortality rate. This study examined the overall and race specific age-adjusted incidence rate as well as incidence-based mortality rate of endometrial cancer in the United States from 1975-2016.

Methods: Surveillance, Epidemiology, and End Results (SEER) 1975-2016 data were used. Overall and race specific age-adjusted incidence rate, incidence-based mortality rates and 95% confidence intervals were calculated Trend graphs were created, annual average percent change and annual percent change were calculated using joinpoint regression analysis. All analyses were conducted using SEER*Stat Software.

Results: The overall age-adjusted incidence rate of endometrial cancer from 1975-2016 was estimated to 20.7 (95% CI 20.6-20.8) per 100,000 and the age-adjusted incidence-based mortality rate was 11.9 (95% CI 11.8-12) per 100,000. Among white women, the annual average percent change in the incidence-based mortality rate of endometrial cancer from 1975 through 2016 showed an overall increase of 5.4%. From 1993 till 2016 the incidence rates among African American women had increased by 2.1% per year.

Conclusion: Endometrial cancer burden is increasing especially among African American women. Developing control and prevention methods coupled with better access to appropriate care can help in reducing endometrial cancer disparity and burden.

Keywords: ***Endometrial Cancer, Corpus Uteri Cancer, Incidence, Incidence-Based Mortality, and Racial Disparity*.**

Background

Endometrial cancer also referred to as uterine corpus cancer is the fourth most common cancer diagnosed among US women (Henley, Miller, Dowling, Benard & Richardson, 2018). It is also the most common cancer of the female reproductive organs and the seventh most common cause of cancer mortality in the US (American Cancer Society, 2019a; Henley, Miller, Dowling, Benard & Richardson, 2018).

Endometrial cancer develops in the endometrium layer of the uterus (American Cancer Society, 2019b). Common signs and symptoms of endometrial cancer are pelvic pain or pressure, vaginal bleeding after menopause, weight loss, abnormal vaginal discharge and bleeding between periods (Mayo Clinic, 2019). Obesity and insufficient physical activity are the most common risk factor as an estimated 70% of uterine corpus cancers are attributed to them (American Cancer Society, 2019c). The risk of endometrial cancer also increases with age (Centers for Disease Control and Prevention (CDC), 2019a). Other risk factors include an increased amount of estrogen in the body, never having been pregnant, ovarian diseases such as polycystic ovarian syndrome (PCOS), late menopause and family history (Mayo Clinic, 2019). There is no specific screening test for endometrial cancer but some of the commonly used diagnostic methods are an endometrial biopsy, Dilation and Curettage (D&C), and hysteroscopy (MD Anderson Cancer Center, 2019).

In the United States, 56,808 new cases of endometrial cancer were reported in 2016 with an incidence rate of 27 cases per 100,000 women. In the same year, 10,733 women died because of endometrial cancer (CDC, 2019b). In 2019, an estimated 61,880 cases of endometrial cancer will be diagnosed in the United States and about 12,160 deaths will occur due to endometrial cancer (American Cancer Society, 2019a). Studies also suggest that endometrial cancer is one of the few

cancers in the United States that has an increasing incidence and mortality and the numbers are predicted to continue to increase (Cote, Ruterbusch, Olson, Lu, & Ali-Fehmi, 2015; Henley, Miller, Dowling, Benard & Richardson, 2018). Along with the increasing incidence of endometrial cancer, some studies have reported racial disparities in mortality rates of endometrial cancer in the recent years (Doll, Winn, & Goff, 2017; Long, Liu, & Bristow, 2013; Rauh-Hain et al., 2015).

Previous studies that examined the endometrial cancer incidence rates and incidence-based mortality rates only used data generated mainly for the last two decades (Cote, Ruterbusch, Olson, & Ali-Fehmi, 2015; Henley, Miller, Dowling, Benard, & Richardson, 2018; Long, Liu, & Bristow, 2013). There was a research gap in reporting of incidence and mortality rate trends of data available for all years i.e. from 1975-2016. No study has comprehensively analyzed the incidence and mortality data along with providing information about significant time trend changes and annual percent change.

Since endometrial cancer is relatively uncommon, by estimating the time trends from 1975-2016, a better understanding of the incidence and mortality rates can be developed. Estimation of the time periods where significant changes occur could help in identifying factors that might be associated with an increased incidence or mortality rate. These factors could potentially be studied to provide better future recommendations to reduce the burden of endometrial cancer. Therefore, this study aimed to examine the overall and race specific age-adjusted incidence rate and incidence-based mortality of endometrial cancer in the United States from 1975-2016.

The aims and hypothesis of this study were:

Aim 1: Examine overall and race specific age-adjusted incidence rates of endometrial cancer in the United States during the period 1975-2016

Hypothesis: The age-adjusted incidence rate of endometrial cancer is significantly higher among African American women than among white women.

Aim 2: Examine overall and race specific age-adjusted incidence-based mortality rate of endometrial cancer in the United States.

Hypothesis: The age-adjusted incidence-based mortality rate of endometrial cancer is significantly higher among African American women than among white women.

Methods

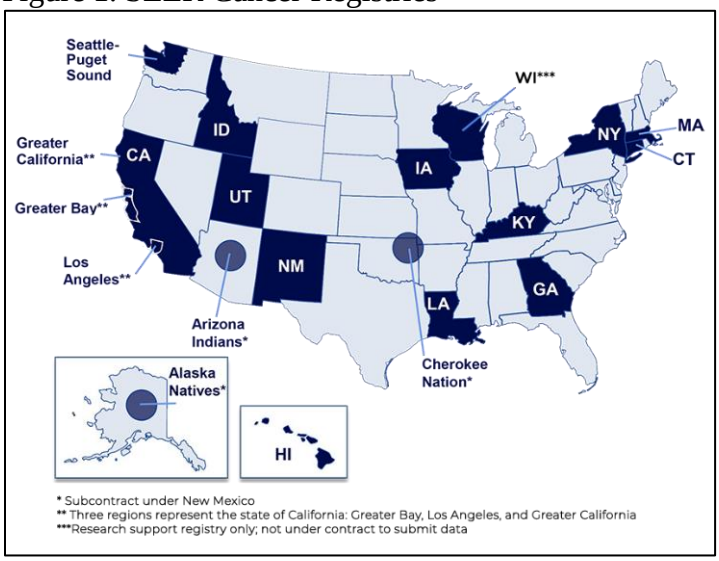
Study Design:

This was a secondary data analysis study using the 1975-2016 Surveillance, Epidemiology, End Results (SEER) database.

SEER Program:

The Surveillance, Epidemiology, and End Results (SEER) is a population-based program of the National Cancer Institute (National Cancer Institute, 2019a). SEER began collecting data in 1973 in the states of Connecticut, Iowa, New Mexico, Utah, and Hawaii and the metropolitan areas of Detroit and San Francisco-Oakland (National Cancer Institute, 2019b). Since then the SEER Program has been expanded and it now covers 21 population-based registries (Figure 1) and covers approximately 34.6% of the U.S. population. The SEER Program registries collect data on patient demographics, tumor site, tumor morphology, stage at diagnosis, first course of treatment, and follow-up for vital status.

Figure 1. SEER Cancer Registries



Study Dataset:

There are four combinations of SEER registries available (SEER 9, SEER 13, SEER 18, SEER 21). For our analysis, we used the SEER 9 dataset that covers the longest period of time (1975-2016) among all 4 groupings. The SEER 9 dataset covers the following geographic areas: Atlanta (Metropolitan), Connecticut, Detroit (Metropolitan), Hawaii, Iowa, New Mexico, San Francisco-Oakland SMSA(Standard Metropolitan Statistical Area), Seattle (Puget Sound), and Utah (National Cancer Institute, 2019c).

We used the *"Incidence - SEER 9 Regs Research Data, Nov 2018 Sub (1975-2016) <Katrina/Rita Population Adjustment>"* dataset for Aim 1 and *"Incidence-Based Mortality - SEER 9 Regs Research Data, Nov 2018 Sub (1975-2016) <Katrina/Rita Population Adjustment>"* dataset for Aim 2. SEER 9 dataset covers approximately 9.4% of the U.S. population and rates are available for white, African American, other (American Indian/Alaskan Native (AI/AN), Asian or Pacific Islander (API)) races. It also has two age variables: 19 age groups (< 1 year, 1-4 years, 5-9 years, ..., 85+ years) and single ages with 85+ (National Cancer Institute, 2019d).

Study Population:

As endometrial cancer primarily affects adult women, our study only included women who were older than 19 years at the time of endometrial cancer diagnosis. Incidence and mortality rates were calculated among women for all endometrial cancer stages and grades. The ICD-O-3 site codes examined were Corpus Uteri C540-C549 and Uterus, NOS C559.

Statistical Software Used:

We used the SEER*Stat software (Version 8.3.6) to examine age-adjusted rates and incidence mortality rates. We used Joinpoint Regression Program (Version 4.7.0.0) to examine the time trends.

Statistical Analysis:

The age adjustment was done according to the 2000 US census data (2000 Standard US population). An age-adjusted rate is a weighted average of the crude rates, where the weights are the proportions of persons in the corresponding age groups of a standard population (National Cancer Institute, 2019e). By age-adjusting, the potential confounding effect of age was reduced as the rates were calculated using the same standard population. The existing age variable in the SEER*Stat software was used to create a user-defined age group that had women older than 19 years. The required ICD-O-3 site codes (Corpus Uteri C540-C549 and Uterus, NOS C559) were defined and the analysis was performed. The overall and race specific incidence and mortality rate along with confidence intervals were obtained for each year. The age-adjusted incidence rates were calculated by first identifying the number of cases of endometrial cancer (ICD-O-3 Site codes defined above) for each age group above 19 years in the SEER 9 registries from 1975-2016. Crude rates were calculated for each age group using the population data. Proportions

based on the standard population (2000 US population) were estimated for each age group and were used as weights. The age adjusted rate was obtained by multiplying each crude rate by the appropriate weight and summing the products. Same procedure was followed when calculating incidence-based mortality rate (dataset for mortality rate was used). Incidence-based mortality is different from mortality rate as it allows a partitioning of mortality by variables associated with the cancer onset (National Cancer Institute, 2019f; Saad, Turk, Al-Husseini, & Abdel-Rahman, 2018). Mortality data collected from death certificate has a limitation as it does not provide information about the onset of disease, stage at diagnosis or the disease histology. SEER collect these types of data and allow the calculation of an incidence-file based mortality rate. It however does not change the overall mortality rate.

These tables were then retrieved as ASCII text files. A total of four ASCII files were extracted. Two files contained data about overall and race based age-adjusted incidence rates and the other two had overall and race based mortality data.

These files were then used as input files for performing joinpoint analysis using the Joinpoint Regression Program (Version 4.7.0.0). The ASCII files were then analyzed in Joinpoint software one by one. For each model, a minimum of zero joinpoint (produces one-line segment) and a maximum of five joinpoints (produces six-line segments) were allowed. Overall incidence and mortality trend graphs were obtained from 1975-2016. Joinpoint regression is a weighted least-squares regression method that fits linear segments to log-transformed rates (Jamison, Noone, Ries, Lee, & Edwards, 2013). Line segments are joined at points called joinpoints. Each joinpoint denotes a statistically significant (P = .05) change in trend. Joinpoint analysis created separate trend graphs for each race. The average annual percent change and year trends with a

significant change in incidence and mortality rates were calculated. The annual percent change was also measured for each significant time trend.

Results

Age-Adjusted Incidence Rate:

The age-adjusted incidence rate for endometrial cancer among US adult women for the period 1975-2016 was 20.7 per 100,000 with an estimated 95% confidence interval of 20.6-20.8. The latest age-adjusted incidence rate in 2016 was 20.8 (20.2-21.4) per 100,000. Table 1 shows the annual age-adjusted incidence rate of endometrial cancer from 1975-2016. The highest incidence rate reported was 29.5 (95% CI 28.6-30.5) per 100,000 in 1975 and the lowest incidence rate was observed in 2003 and 2006 at 18.7 (95% CI 18.1-19.3) per 100,000.

For the period 1975-2016, the overall age-adjusted incidence rate of endometrial cancer varied by race – it was highest among whites at 21.4 per 100,000, followed by women in the other race category at 15.8 per 100,000, and lowest among African Americans at 17.5 per 100,000. There were statistically significant differences in the overall age-adjusted incidence rates during the period 1975-2016 among these three groups. However, in 2016, the age-adjusted incidence rate among African American women was 22.4 (95% CI 20.6-24.4) per 100,000, significantly higher than the age-adjusted incidence rate among white at 20.5 (95% CI 19.9-21.5) per 100,000.

The overall and race based AAPC and APC of age-adjusted incidence rates (1975-2016) are reported in Table 3 and Figures 2-4. The Joinpoint analysis results indicate that the overall average annual percent change (AAPC) in the incidence rate of endometrial cancer from 1975 through 2016 was -0.9 percent. The largest decline was observed from 1975 through 1979 when the incidence rate decreased by 6.6 per year. The overall rates have remained stable from 2009 to

2016 with a 0.0% annual percent change (APC). Among white women, the annual average percent change in the incidence rate of endometrial cancer from 1975 through 2016 was -1.1%. From 1974 till 1979 the incidence rate decreased by 6.7% per year and from 1979 to 1988 the annual percent change was -1.7%. In recent years (2010-2016) the rates have been decreasing by 0.2% per year. For African American women, the annual average percent change of incidence rate from 1975-2016 was +1% per year. Between 1975 and 1993 the incidence rate decreased by 0.5% per year but from 1993 till 2016 the rates had increased by 2.1% per year.

Age-Adjusted Incidence-Based Mortality Rate:

The annual age-adjusted incidence-based mortality rates from 1975 through 2016 are summarized in Table 4. The overall age-adjusted incidence-based mortality rate of endometrial cancer for the years 1975-2016 was 11.9 (95% CI 11.8-12) per 100,000. The highest incidence-based mortality rate was 14.5 (95% CI 13.9-15) per 100,000, which was noted in the year 2002, whereas, the lowest incidence rate was reported as 11.7 (95% CI 1.4-1.9) per 100,000 in 1975. The age-adjusted incidence-based mortality rate observed for the most recent year (2016) was 13.2 (95% CI 12.8-13.7) per 100,000.

As shown in Table 5, among white women the overall age-adjusted incidence-based mortality rate of endometrial cancer from 1975-2016 was 12.3 (95% CI 12.2-12.4) per 100,000, which was almost similar to the overall incidence-based mortality rate observed in African American women at 12 (95% CI 11.7-12.3) per 100,000 The highest and lowest incidence-based mortality rate reported for white women was 15.1 (95% CI 14.5-15.7) per 100,000 in 2002 and 2005 and 1.6 (95% CI 1.4-1.9) in 1975 respectively. For African American women, the highest incidence-based mortality rate was observed in 2011 which was 14.9 (95% CI 13.1-16.8) per 100,000 and the lowest incidence-based mortality rate was 2.5 (95% CI 1.4-4) in 1975. In 2016, the

incidence-based mortality rate among African American women was 14.7 (95% CI 13.1-16.5) per 100,000 which was higher as compared to white women whose incidence-based mortality was estimated to be 13.7 (95% CI 13.1-14.2) per 100,000.

Overall average annual percent change in the incidence-based mortality rate of endometrial cancer from 1975 through 2016 was +5.1% (Table 6). From 1975-1977 the most significant change was observed where the incidence-based mortality rates increased by 58.9% per year. An annual increase in rates was also reported from 1977-2001. The rates declined by only 0.4% per year from 2001-2016. Among white women, the annual average percent change in the incidence-based mortality rate of endometrial cancer from 1975 through 2016 is 5.4%. The most significant increase was observed through 1975-1979 wherein the rates increased by 63.5 % per year. An annual decline in rates is noted from 2001-2005 with a 0.4% decrease per year. The average annual percent change in the incidence-based mortality rate of endometrial cancer amid African American women from 1975 till 2016 is 2.8%. The rates increased by 12.4% per year starting from 1975 through 1981. The rates still consistently increased from 1981 to 2016 by 1.3% per year.

Discussion

Summary and Major Findings:

This study reports the age-adjusted incidence and incidence-based mortality rates data for the most available years (1975-2016) in the United States. Overall and race specific incidence and mortality rates were estimated. The overall age-adjusted incidence rate of endometrial cancer from 1975-2016 was calculated to be 20.7 (95% CI 20.6-20.8) per 100,000. A declining trend in the overall incidence rate was noted from 1975-1988. These rates then increased by 3,2% per

year from 2006-2009 which was similar to the increased incidence rate reported by Cote et al., 2015. The rates were found to be consistent from 2009-2016 with no an annual percent change. This study highlights the importance of examining the time trends for specific population groups. While the age-adjusted incidence rate for the combined years from 1975-2016 was significantly higher among white women at 21.4 per 100,000 as compared to an incidence rate of 17.5 among African American women, in 2016, the incidence rate among African American women was 22.4 (95% CI 20.6-24.4) per 100,000 and 20.5 (95% CI 19.9-21.5) per 100,000 among white women. Incidence rates were higher among white and African American women as compared to other race groups for 2016. Our results were comparable with the findings of Henley et al., 2018 who also described a higher incidence rate among African American and white women as compared to other racial groups in 2015.

We observed different time trends of endometrial incidence rates between whites and African American women. From 2010-2016, the rates had been decreasing by 0.2% per year among white women whereas they had been increasing by 2.1% per year amid African American women. Even the average annual percent change from 1975-2016 was higher for African American women. One of the potential contributing factors for this difference could be the higher and consistently increasing obesity rates among African American women as compared to white women (American Cancer Society, 2019c; Block, Rawat, Brosgart, & Francisco, 2017). The overall age-adjusted incidence-based mortality rate of endometrial cancer for the years 1975-2016 was 11.9 (95% CI 11.8-12) per 100,000 and the average annual percent change is 5.1%, which indicates an overall increasing trend of endometrial cancer mortality. In 2016, the mortality rate among African American women was 14.7 (95% CI 13.1-16.5) which was higher than the observed mortality rate of 13.7 (95% CI 13.1-14.2) among white women and our study

finding was also similar to other studies like Henley et al.,(2018) who have also reported higher mortality rate among African American women in 2016. These results align with our study hypothesis of higher mortality rate among African American women compared to white women for 2016. Significant annual percent change in the incidence-based mortality rate was observed between 1975-1977 where the overall rate increased by 58.9% per year and by 63.5% per year among white women but between 2001-2016 the rates have decreased by 0.4% per year. The mortality trends data also suggests that the mortality rate had been increasing by 1.3% per year among African American women. These increasing rates could be associated with late stage diagnosis of endometrial cancer among African American women as compared to early diagnosis amid white women. This association was also reported in studies by Baskovic et al., (2018) and Rauh-Hain et al., (2015).

Strengths and Limitations

Our study utilized a dataset that has endometrial incidence and mortality data for the most available years. Therefore, our results are comprehensive. Also, it was the first study to estimate the AAPC and APC of endometrial cancer incidence and incidence-based mortality rate from 1975-2016. This study also has some potential limitations. One of the main limitations is that since (SEER) cancer registries collect limited information on sociodemographic information and potential risk factors, it was not possible to identify reasons for changes in the trends. Other study limitation is that the findings of our study cannot be generalized to women living outside of SEER 9 program areas.

This study highlights the burden of endometrial cancer especially among African American women. Steps should be taken to develop effective interventions strategies which allow early detection of endometrial cancer among African American Women. Future studies could

investigate factors associated with changes in incidence and mortality trends. By designing control and prevention measures and increasing awareness among women about endometrial cancers' risk factors and the importance of seeking timely healthcare would help in reducing endometrial cancer disparities and overall disease burden.

Tables and Figures

Table 1: Overall age-adjusted incidence rates of endometrial cancer in adult (Age >19 Years) women from 1975-2016.

Year	Rate (per 100,000)	Lower CI	Upper CI
1975	29.5	28.6	30.5
1976	28.5	27.5	29.4
1977	25.8	25.0	26.7
1978	24.8	23.9	25.7
1979	22.6	21.8	23.4
1980	22.2	21.4	23.1
1981	22.0	21.2	22.8
1982	21.6	20.9	22.4
1983	21.4	20.6	22.2
1984	20.8	20.1	21.6
1985	20.5	19.8	21.3
1986	19.7	19.0	20.4
1987	19.9	19.2	20.7
1988	19.0	18.3	19.7
1989	19.6	18.8	20.3
1990	20.1	19.4	20.8
1991	19.7	19.0	20.4
1992	19.8	19.1	20.5
1993	19.5	18.8	20.2
1994	19.9	19.3	20.6
1995	19.9	19.2	20.6
1996	19.7	19.1	20.4
1997	20.3	19.6	20.9
1998	20.1	19.4	20.7
1999	19.8	19.1	20.4
2000	19.2	18.6	19.9
2001	19.6	18.9	20.2
2002	19.2	18.5	19.8
2003	18.7	18.1	19.3
2004	19.2	18.6	19.8
2005	19.0	18.4	19.6
2006	18.7	18.1	19.3
2007	19.2	18.6	19.8
2008	19.7	19.1	20.3
2009	20.7	20.1	21.3
2010	20.7	20.1	21.3
2011	20.4	19.8	21.0
2012	20.6	20.0	21.2
2013	20.2	19.6	20.8
2014	20.6	20.0	21.2
2015	20.5	20.0	21.1
2016	20.8	20.2	21.4
1975-2016	20.7	20.6	20.8

Table 2: Race based age-adjusted incidence rates of endometrial cancer in adult (Age >19 Years) women from 1975-2016

Year	White			African American			Others*		
	Rate	LCI	UCI	Rate	LCI	UCI	Rate	LCI	UCI
1975	31.1	30.1	32.2	16.6	13.7	19.9	17.3	14.2	20.9
1976	30.1	29.1	31.1	14.7	12.0	17.9	17.9	14.5	21.7
1977	27.1	26.1	28.1	16.9	14.1	20.1	16.3	13.3	19.7
1978	26.2	25.2	27.1	15.7	13.1	18.7	11.6	9.2	14.4
1979	23.6	22.7	24.5	14.4	11.9	17.2	14.6	11.8	17.7
1980	23.3	22.4	24.2	13.5	11.2	16.2	15.2	12.5	18.4
1981	22.9	22.1	23.8	14.4	11.9	17.2	15.5	12.8	18.5
1982	22.8	21.9	23.7	14.1	11.7	16.8	13.8	11.3	16.7
1983	22.4	21.6	23.3	15.5	13.1	18.3	13.3	10.9	16.1
1984	21.9	21.1	22.8	14.5	12.1	17.1	11.5	9.3	13.9
1985	21.5	20.7	22.4	14.9	12.6	17.5	12.3	10.1	14.8
1986	20.7	19.9	21.5	13.9	11.7	16.3	13.2	10.9	15.7
1987	21.1	20.3	21.9	13.2	11.1	15.5	12.5	10.4	14.9
1988	19.8	19.1	20.6	13.9	11.8	16.3	13.5	11.4	16.0
1989	20.4	19.6	21.2	16.2	13.9	18.8	13.2	11.1	15.6
1990	21.2	20.4	22.0	14.2	12.1	16.6	12.1	10.1	14.3
1991	20.8	20.0	21.6	14.4	12.3	16.8	12.9	10.9	15.2
1992	20.8	20.0	21.6	14.4	12.3	16.7	13.2	11.2	15.3
1993	20.5	19.8	21.3	14.3	12.3	16.6	12.9	11.0	15.0
1994	20.9	20.1	21.6	14.6	12.6	16.9	14.1	12.2	16.2
1995	20.8	20.0	21.6	15.4	13.3	17.6	14.5	12.6	16.5
1996	20.5	19.8	21.3	16.3	14.2	18.6	14.7	12.8	16.8
1997	21.3	20.5	22.0	14.0	12.0	16.1	15.2	13.3	17.2
1998	20.9	20.2	21.7	16.1	14.1	18.4	14.6	12.8	16.6
1999	20.7	20.0	21.5	14.8	12.8	16.9	15.0	13.2	16.9
2000	20.2	19.5	20.9	15.1	13.1	17.2	13.9	12.2	15.7
2001	20.5	19.8	21.2	16.0	14.0	18.2	14.0	12.4	15.8
2002	19.3	18.6	20.0	19.0	16.9	21.2	16.9	15.1	18.8
2003	19.5	18.8	20.2	16.6	14.6	18.7	13.5	11.9	15.2
2004	19.7	19.1	20.5	16.9	15.0	19.0	15.8	14.2	17.6
2005	19.4	18.7	20.1	19.5	17.4	21.8	15.5	13.9	17.2
2006	19.6	18.9	20.3	15.7	13.9	17.7	13.5	12.1	15.1
2007	19.6	18.9	20.3	18.5	16.5	20.6	16.3	14.7	18.0
2008	19.9	19.3	20.6	19.7	17.8	21.8	17.1	15.6	18.9
2009	20.9	20.2	21.6	20.6	18.6	22.7	17.8	16.2	19.5
2010	20.9	20.2	21.6	20.2	18.2	22.3	18.8	17.2	20.5
2011	20.3	19.6	21.0	22.9	20.9	25.1	18.2	16.6	19.9
2012	20.8	20.2	21.5	20.3	18.5	22.3	17.5	16.0	19.1
2013	20.0	19.3	20.6	22.4	20.5	24.5	19.0	17.5	20.7
2014	20.9	20.3	21.6	20.8	19.0	22.8	17.0	15.5	18.5
2015	20.4	19.7	21.1	22.3	20.4	24.2	18.4	17.0	20.0
2016	20.5	19.9	21.2	22.4	20.6	24.4	19.0	17.5	20.5
1975-2016	21.4	21.3	21.5	17.5	17.1	17.8	15.8	15.5	16.1

**Other includes American Indian/AK Native, Asian/Pacific Islander*

Table 3: Overall and race based annual age-adjusted incidence rate trends (Joinpoint Analysis for 1975-2016)

		Joinpoint Analysis (1975-2016)											
		Trend 1		Trend 2		Trend 3		Trend 4		Trend 5		Trend 6	
Overall/Race	**AAPC****	**Years**	**APC***	**Years**	**APC***	**Years**	**APC***	**Years**	**APC***	**Years**	**APC***	**Years**	**APC***
Overall	-0.9	1975-1979	-6.6	1979-1988	-1.8	1988-1997	0.4	1997-2006	-0.8	2006-2009	3.2	2009-2016	0.0
White	-1.1	1975-1979	-6.7	1979-1988	-1.7	1988-1997	0.3	1997-2005	-1.1	2005-2010	1.4	2010-2016	-0.2
African American	1.0	1975-1993	-0.5	1993-2016	2.1								

**AAPC is the Average Annual Percent Change

*APC is the Annual Percent Change

Figure 2: Overall age-adjusted incidence rate trend of endometrial cancer (Joinpoint Analysis for 1975-2016)

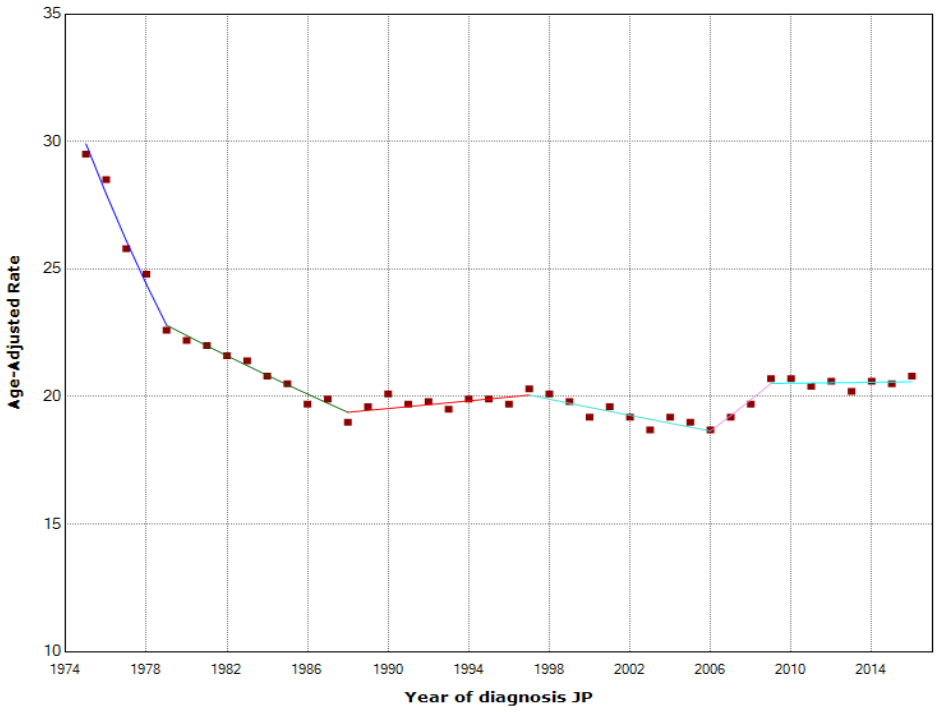


Figure 3: Age-adjusted incidence rate trend of endometrial cancer among adult white women (Joinpoint Analysis for 1975-2016)

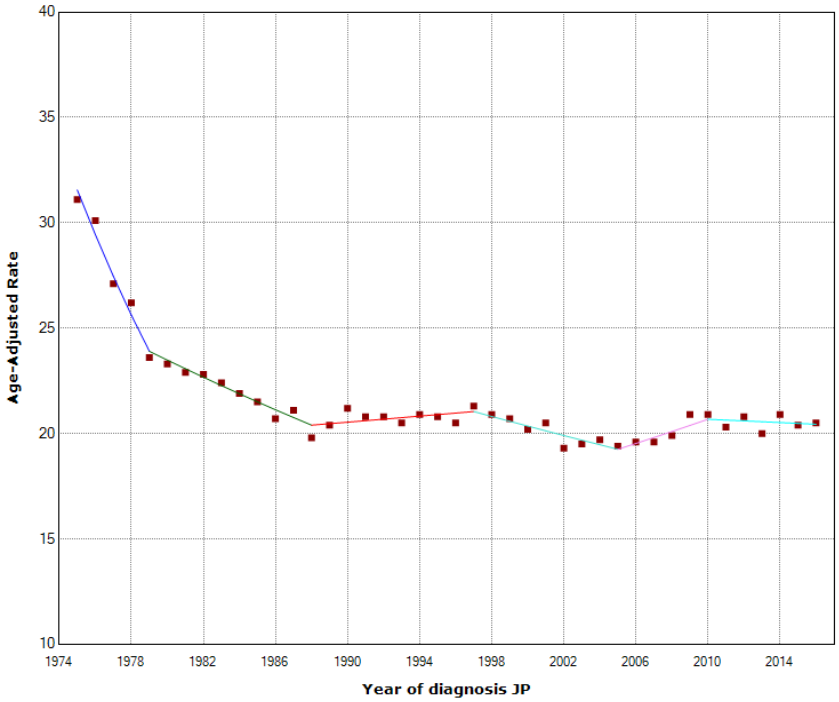


Figure 4: Age-adjusted incidence rate trend of endometrial cancer among adult African American women (Joinpoint Analysis for 1975-2016)

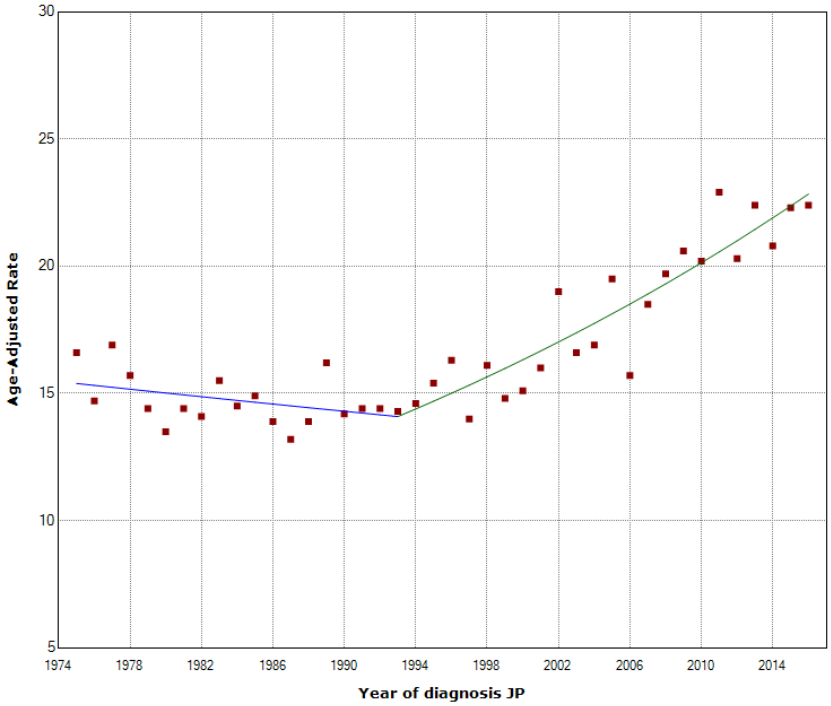


Table 4: Overall age-adjusted incidence-based mortality rates of endometrial cancer in adult (Age >19 Years) women from 1975-2016

Year	Rate (per 100,000)	Lower CI	Upper CI
1975	1.7	1.4	1.9
1976	3.2	2.9	3.5
1977	4.3	3.9	4.7
1978	5.3	4.9	5.7
1979	5.7	5.3	6.2
1980	6.7	6.2	7.2
1981	7.6	7.2	8.1
1982	8.0	7.5	8.5
1983	8.0	7.5	8.5
1984	8.0	7.6	8.5
1985	8.7	8.2	9.2
1986	8.6	8.2	9.2
1987	8.9	8.4	9.4
1988	9.5	9.0	10.0
1989	10.4	9.9	10.9
1990	9.9	9.4	10.4
1991	10.7	10.1	11.2
1992	10.8	10.3	11.4
1993	11.5	10.9	12.0
1994	11.3	10.8	11.8
1995	11.8	11.3	12.4
1996	12.6	12.1	13.2
1997	12.5	12.0	13.0
1998	13.4	12.9	14.0
1999	13.4	12.8	13.9
2000	13.8	13.3	14.4
2001	14.2	13.7	14.8
2002	14.5	13.9	15.0
2003	14.4	13.9	15.0
2004	14.1	13.6	14.7
2005	14.4	13.9	14.9
2006	13.9	13.4	14.4
2007	13.9	13.4	14.4
2008	14.0	13.5	14.6
2009	13.7	13.2	14.2
2010	14.0	13.5	14.5
2011	14.2	13.7	14.7
2012	13.6	13.2	14.1
2013	13.9	13.5	14.4
2014	14.0	13.6	14.5
2015	13.7	13.3	14.2
2016	13.2	12.8	13.7
1975-2016	11.9	11.8	12

Table 5: Race based age-adjusted incidence-based mortality rates of endometrial cancer in adult (Age >19 Years) women from 1975-2016

Year	White			African American			Others*		
	Rate	LCI	UCI	Rate	LCI	UCI	Rate	LCI	UCI
1975	1.6	1.4	1.9	2.5	1.4	4.0	0.5	0.1	1.4
1976	3.0	2.6	3.3	7.1	5.0	9.6	2.6	1.3	4.6
1977	4.3	3.9	4.7	6.3	4.5	8.6	2.0	1.0	3.6
1978	5.2	4.8	5.7	6.9	5.2	9.0	2.7	1.5	4.4
1979	5.8	5.3	6.2	7.0	5.2	9.1	2.4	1.3	4.0
1980	6.8	6.3	7.3	8.5	6.5	10.9	1.5	0.8	2.7
1981	7.7	7.2	8.3	9.2	7.1	11.6	3.6	2.2	5.4
1982	8.0	7.5	8.5	10.7	8.5	13.3	3.8	2.4	5.5
1983	8.1	7.6	8.6	8.5	6.6	10.6	4.8	3.4	6.7
1984	8.2	7.7	8.7	9.4	7.4	11.7	3.4	2.2	4.9
1985	8.8	8.3	9.3	10.7	8.7	13.1	3.8	2.6	5.4
1986	8.8	8.3	9.3	10.5	8.4	12.8	3.4	2.3	5.0
1987	9.3	8.8	9.9	8.7	6.9	10.7	2.7	1.7	4.0
1988	9.8	9.3	10.4	9.8	7.9	12.0	4.3	3.0	5.9
1989	10.6	10.1	11.2	11.7	9.6	14.0	4.7	3.4	6.4
1990	10.2	9.7	10.8	10.6	8.6	12.8	4.0	2.9	5.5
1991	11.1	10.5	11.6	10.7	8.8	12.8	4.3	3.1	5.8
1992	11.3	10.7	11.8	10.1	8.2	12.1	4.7	3.5	6.2
1993	11.8	11.2	12.4	12.3	10.3	14.5	5.6	4.2	7.1
1994	11.6	11.0	12.2	11.6	9.7	13.7	6.2	4.8	7.8
1995	12.2	11.7	12.8	11.4	9.5	13.5	6.1	4.8	7.7
1996	13.3	12.7	13.9	11.0	9.1	13.0	6.1	4.8	7.5
1997	13.0	12.4	13.6	11.9	10.0	14.0	6.4	5.1	7.8
1998	14.2	13.6	14.8	10.9	9.2	13.0	5.8	4.6	7.2
1999	14.1	13.5	14.7	11.5	9.7	13.5	5.7	4.5	7.0
2000	14.5	13.9	15.1	13.6	11.7	15.8	6.4	5.2	7.8
2001	14.9	14.3	15.6	11.8	10.0	13.8	7.5	6.2	9.0
2002	15.1	14.5	15.7	13.0	11.1	15.1	7.9	6.6	9.4
2003	15.0	14.4	15.7	13.4	11.5	15.5	7.8	6.6	9.2
2004	14.8	14.2	15.4	12.8	11.0	14.8	7.3	6.1	8.6
2005	15.1	14.5	15.7	12.9	11.1	14.9	7.1	6.0	8.4
2006	14.6	14.0	15.2	12.8	11.1	14.8	6.9	5.8	8.1
2007	14.6	14.1	15.2	12.1	10.4	13.9	7.3	6.2	8.6
2008	14.8	14.2	15.4	13.5	11.7	15.4	6.7	5.7	7.9
2009	14.3	13.7	14.8	13.2	11.5	15.0	8.1	7.0	9.4
2010	14.5	14.0	15.1	13.1	11.4	14.9	9.0	7.8	10.3
2011	14.8	14.2	15.4	14.9	13.1	16.8	8.2	7.1	9.4
2012	14.3	13.8	14.9	14.2	12.5	16.0	7.2	6.2	8.3
2013	14.6	14.0	15.1	14.4	12.8	16.3	7.9	6.9	9.0
2014	14.8	14.2	15.3	14.5	12.9	16.3	7.5	6.5	8.6
2015	14.3	13.8	14.9	13.9	12.4	15.6	8.5	7.5	9.6
2016	13.7	13.1	14.2	14.7	13.1	16.5	8.4	7.4	9.5
1975-2016	12.3	12.2	12.4	12	11.7	12.3	6.6	6.4	6.8

**Other includes American Indian/AK Native, Asian/Pacific Islander*

Table 6: Overall and race based annual age-adjusted incidence-based mortality rate trends (Joinpoint Analysis for 1975-2016)

Joinpoint Analysis (1975-2016)									
Overall/Race	**AAPC****	**Trend 1**		**Trend 2**		**Trend 3**		**Trend 4**	
		Years	**APC***	**Years**	**APC***	**Years**	**APC***	**Years**	**APC***
Overall	5.1	1975-1977	58.9	1977-1981	13.7	1981-2001	3.3	2001-2016	-0.4
White	5.4	1975-1977	63.5	1977-1981	14.6	1981-2001	3.4	2001-2016	-0.4
African American	2.8	1975-1981	12.4	1981-2016	1.3				

Figure 5: Overall age-adjusted incidence-based mortality rate trend of endometrial cancer (Joinpoint Analysis for 1975-2016)

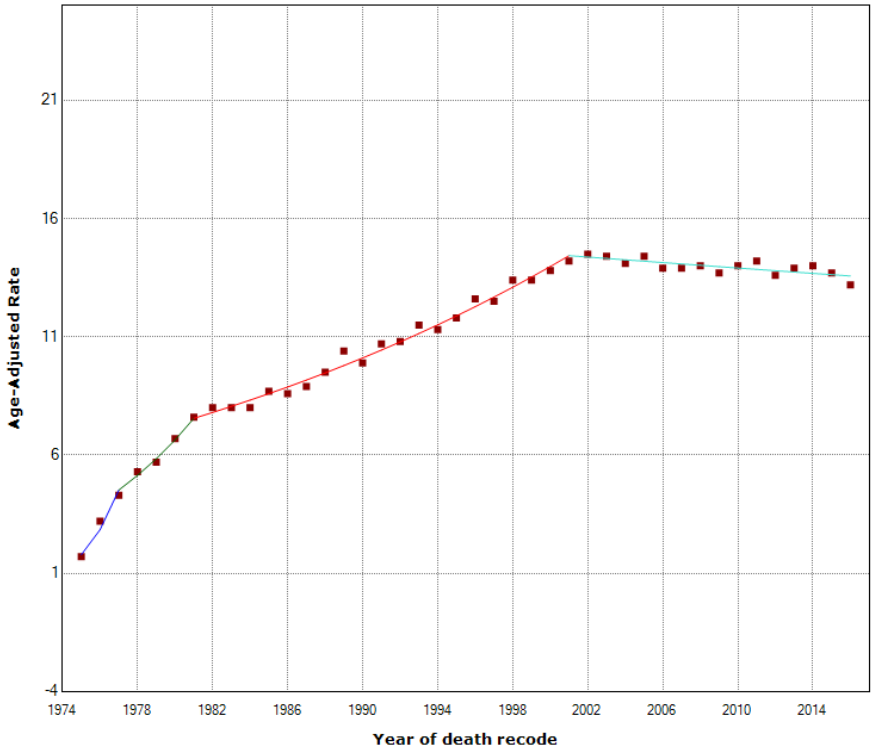


Figure 6: Age-adjusted incidence-based mortality rate trend of endometrial cancer among adult white women (Joinpoint Analysis for 1975-2016)

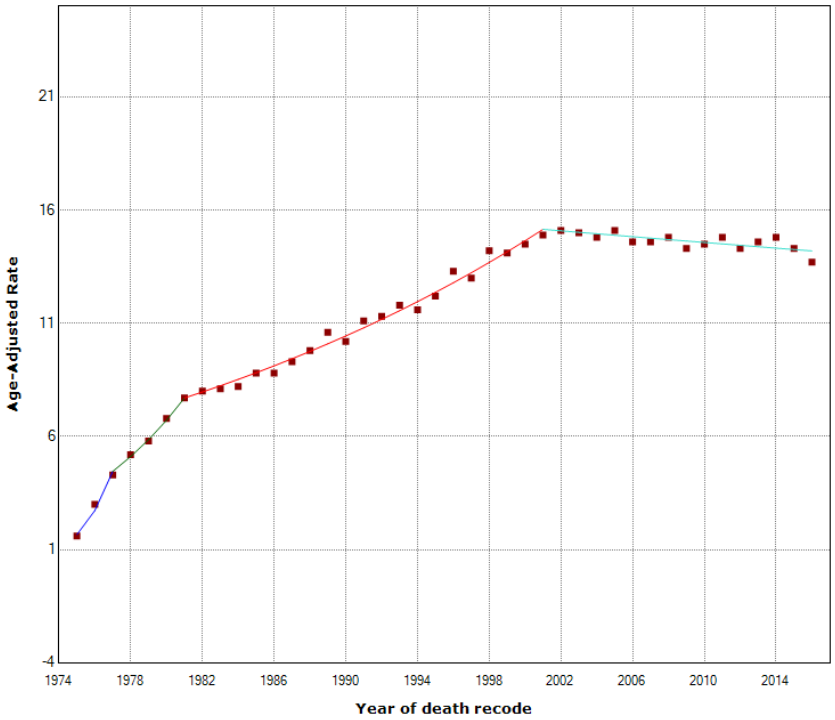
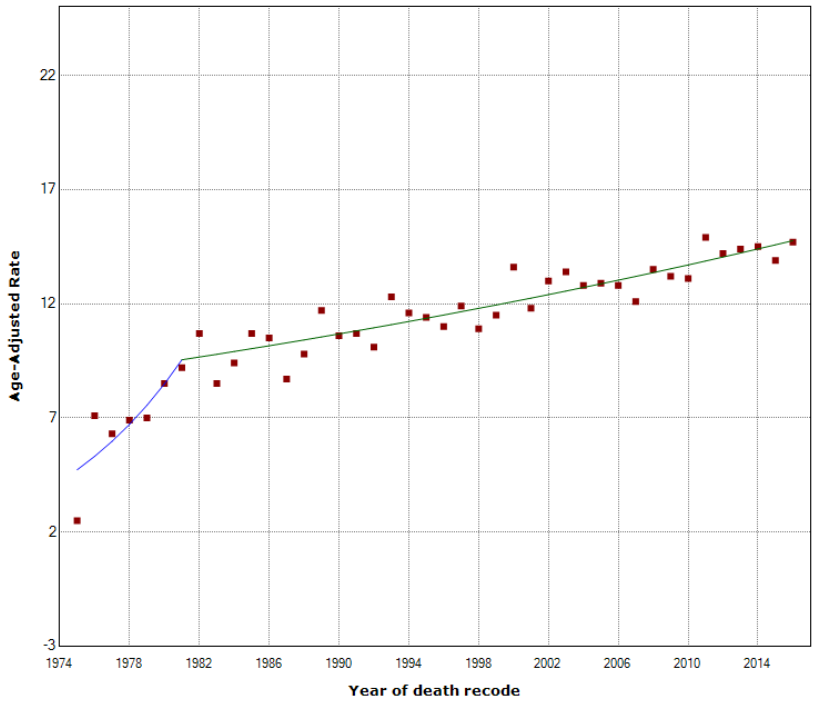


Figure 7: Age-adjusted incidence-based mortality rate trend of endometrial cancer among adult African American women (Joinpoint Analysis for 1975-2016)



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FNU KANISHKA

EDUCATION

Master of Public Health in Epidemiology (GPA: 3.9/4.0) **Aug. 2017-Dec. 2019**
College of Public Health (COPH)
University of Nebraska Medical Center (UNMC), Omaha, NE, USA

Bachelor of Science in Biomedical Science (Hons) (GPA: 4.0/4.0) **May 2016**
University of Delhi, India

PROFESSIONAL EXPERIENCE

Research Assistant **Nov 27-Present**
Department of Epidemiology, COPH, UNMC
Primary Responsibilities: Performing statistical data analysis, designing questionnaires and conducting literature reviews.
Projects Involved in:

1. Project ECHO (Extension for Community Healthcare Outcomes)
   (Collaborative model of medical education and care management that empowers clinicians in 37 countries to manage patients with complex conditions such as: HIV, TB, behavioral health disorders, and many others)
   - Designing questionnaires and data collection tools for post-training focusing on behavioral health.
   - Performing statistical data analysis using SPSS.

2. IDeA-CTR project: Biostatistics, Epidemiology and Research Design Core (BERD)
   (Biostatistics, Epidemiology and Research Design Core provides critical research design, epidemiological, and biostatistical expertise for collaborative research in the advancement of clinical and translational research)
   - Extracting and compiling data from national data sources like the Youth Risk Behavior Surveillance System (YRBSS) etc.
   - Conducting data analysis using SPSS and SAS.
   - Developing data briefs and fact sheets.

3. Mental Health Awareness Training (MHAT) conducted by the Behavioral Health Education Center of Nebraska (BHECN) for veterans and their families.
   - Aiding in data entry for pre and post-training.
   - Performing statistical data analysis using SPSS.

4. Investigate population and primary care clinic level geographic variation in colorectal cancer screening use and related factors in Nebraska.
   - Conducting literature reviews.
   - Performing statistical data analysis using SAS.
   - Assist in the overall working of the project.

5. Intervention to increase cervical cancer screening awareness among Somali refugee women living in Lexington, Nebraska (Project Completed).
    - Collected and analyzed pre and post intervention data.
    - Wrote the final project report.

Intern **Aug. 2018 - Dec. 2018**

Lexington Regional Health Center, Lexington, Nebraska

- Developed a brochure highlighting important adolescent vaccinations for community use.
- Created cervical and breast cancer educational modules for young women.

Teaching Assistant **Aug. 2018 - Dec. 2018**

Introduction to Epidemiology, Department of Epidemiology, COPH, UNMC

Health Educator **June 2016 - April 2017**

Humana People to People India, Delhi, India

- Educated children living in slums and homeless shelters about handwashing and sanitation.
- Performed data collection for ongoing community health surveys.

Children Shelter Home Coordinator **July 2015 - Oct.2015**

Prayas Juvenile Aid Centre Society, Delhi, India

- Facilitated in establishing and coordinating shelter home for distressed, marginalized and neglected street children in Sangam Vihar, Delhi, India (Boys ages between 6-13 years).

PEER-REVIEWED PUBLICATION

- Lorena Baccaglini, Tricia D LeVan, Paraskevi A Farazi, **Kanishka**, Jason M Foster, and Shinobu Watanabe-Galloway. *Population-level geographic variation in Colorectal cancer (CRC) screening use and related factors in Nebraska.* In progress
- Shinobu Watanabe-Galloway, Paraskevi A Farazi, **Kanishka**, Tricia D LeVan, Jungyoon Kim, Jason M Foster, and Lorena Baccaglini. *Geographic variations in the use and preferences of evidence-based colorectal cancer screening interventions among primary care clinics.* In Progress
- **Kanishka**, Kritika Anand, & Smridhi Marwah. *Prevalence and determinants of hookah (Waterpipe Smoking) use among college going girls of Delhi.* Accepted for publication

LEADERSHIP EXPERIENCE

Children vaccination camp navigator **June 2015**

- Volunteered as a navigator for an Influenza vaccination camp organized by the All India Institute of Medical Sciences (AIIMS) in rural areas of Ballabgarh, India.

Health Camp Organizer

Participated as a volunteer in organizing health camps in the following schools in rural areas of India.

- Government High School, Dudoli, India **December 2014**
- Government Middle School, Godhola, India **December 2015**

PROFESSIONAL DEVELOPMENT

Language Skills: English (Fluent), Hindi (Fluent), French (Basic)

Analytical/ Computer Skills: SPSS, SAS, Epi-info, Microsoft Office products (Word, PowerPoint, Publisher, and Excel)