

# Disparities in Cervical Cancer Screening Participation in Iran: A Cross-Sectional Analysis of the 2016 Nationwide Steps Survey

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## Research article

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## Abstract

**Background:** One of the most important concerns in every healthcare system is the elimination of disparities in health service utilization and achievement of health equity. This study aims to investigate the disparities in cervical cancer screening participation in Iran.

**Methods:** A cross-sectional study was conducted using data from the National Non-Communicable Risk Factors Survey in 2016 (STEPS 2016). Data on cervical cancer screening in addition to demographic and socio-economic factors from 15975 women aged 18 and above were analyzed. The distribution of surveyed women with regard to cervical cancer screening practice was described. Chi Square and logistic regression were used to assess the association of demographic and socio-economic factors with cervical cancer screening. Socio-economic equity in screening was assessed by concentration index, and GIS analysis was used to show the provincial indices on the map of Iran.

**Results:** Overall, 52.1% of women aged 30-59 years, had undergone cervical cancer screening at least once in their lifetime. Participation rate in cervical cancer screening programs varied between provinces; ranging from 7.6% in Sistan and Baluchestan to 61.2% in Isfahan. Young age, having no education, and being uninsured were associated with lower participation. Concentration index showed pro-poor inequity for the country and across all provinces, indicating that cervical cancer screening services are less utilised by high income groups. GIS analysis demonstrated spatial disparity across provinces of Iran.

**Conclusions:** Equity and participation in cervical cancer screening in Iran requires improvement. For this to be achieved, new policies shall have a stronger emphasis on the lowest and the highest socio-economic population groups, while current strategies have mostly affected the people with middle socio-economic status.

## Background

Cervical cancer was the fourth most common cancer and the fourth leading cause of cancer deaths in women worldwide in 2018; accounting for 570,000 new cases and 311,000 deaths, equal to 6.6% and 7.5% of the global cancer burden respectively.[1] Rates are significantly higher in developing countries. Over eighty percent of new cases and cervical cancer deaths occur in less developed regions of the world.[2, 3]

Iran is among the countries with low incidence rate for cervical cancer. The estimated average age-standardized incidence rate for the country is 2.5 per 100,000 women. Despite the low rate, mortality to incidence ratio is relatively high at about 42%. The advanced clinical stage, at which most cervical cancers are identified, is responsible for the poor prognosis and higher mortality rates.[4, 5]

The standard secondary prevention method for cervical cancer is cervical cytology, which has been established for more than four decades in most countries.[6] However, studies have documented large discrepancies in the effect of cytology screening programs on cervical cancer rates reduction.[7, 8] The extend of participation of at risk women in screening program has been considered as the primary contributor to these differences. [9] In Iran, the nation-wide cervical cancer screening program has been in operation since 1980s. The program is performed on an opportunistic basis, offering annual cytology smears to women in the targeted age range, 3 years after the onset of their sexual activity. The screening will be continued at 3 years' intervals after three consecutive normal results. The service is provided by midwives through primary public health care settings, and by gynaecologists in private clinics. The recommended target population was primarily defined as women aged 20 to 65, but was later revised to the age range of 30 to 59 in 2017. However, tests outside the program is common specially in private settings. Basic health insurance plans cover most direct costs and patient's contribution is low. [10, 11]

There are different barriers deterring women from participating in cervical cancer screening program including demographic, structural, personal, and socio-cultural factors. These factors will eventually result in differences in cervical cancer screening uptake which tend to be seen as inequities in the service.[12, 13] Existing literature has highlighted factors like age, marital

status, embarrassment, lack of knowledge, and socio-cultural beliefs around cervical cancer as the main causes of non-attendance in cervical cancer screening program in Iran.[14, 15] However, despite the global growing concern about health equity in recent decades, there are limited studies examining regional and socio-economic variations in cervical cancer screening uptake in the country. Hence, this study sought to assess the disparities in cervical cancer screening participation in Iran according to the data obtained from the National Survey of The Risk Factors of Non-Communicable Diseases (STEPs 2016), and to identify socio-demographic factors that predict the participation in cervical cancer screening program.

## Methods

A study was performed using data from the National Survey of The Risk Factors of Non-Communicable Diseases in Iran (STEPs 2016). This cross-sectional household survey was conducted at the national level through personal interviews at homes. To estimate the sample size, a proportional to size sampling plan was adopted using the least populated province of the country as the basis and calculating the sample size of others according to the population ratio of each province to the referenced one. Weighting methods were used for provinces with sample size of 800 or more. In order to control for sampling effect and non-response error, each provincial sample size was increased by 10%. Ultimately 3105 clusters, each consisting of ten households, were selected from urban and rural areas by designing a systematic cluster random sampling frame for all provinces. Additional details on the methodology of the survey is available elsewhere.[16]

Totally 31050 participants aged 18 or older were interviewed nationwide. Among the interviewees 15975 participants were women. All the women were asked the following pap smear screening question: "Have you ever had a Pap test for cervical cancer screening?".

## Variables

In order to assess the determinants of participation in cervical cancer screening program, the outcome variable was defined as having ever undergone cervical cancer screening (yes/no). The independent variables selected for the analysis included age, marital status, education level, employment status, residing area, health insurance coverage, and socio-economic status. For easier interpretation, all variables were categorized. Age was categorized in ten-year age groups, and education level was classified by number of years attained. Additionally, employment status was defined as either employed, unemployed, retired, or student. Residing area was categorized as urban or rural area, and insurance coverage as having been covered or not.

In order to measure socio-economic inequality in cervical cancer screening participation, a single living standard variable was produced through principal component analysis (PCA) statistical method and by using data from household assets. Asset variables included home, car, kitchen, bathroom, phone, TV, air cooler, central heating system, refrigerator, freezer, oven, vacuum cleaner, washing machine, dishwasher, personal computer, mobile phone, internet access, and having access to water and gas pipelines. To check if the data is suitable for data reduction, the following two tests, Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's test of sphericity, were carried out prior to PCA. The value of KMO obtained was 0.787 and the result of Bartlett's test of sphericity was significant, therefore PCA was appropriate.[17] In the analysis performed, seven components had eigenvalues greater than 1 and explained 64% of the variation in the data. A socio-economic status variable was created by retaining the principal component with the largest eigenvalue. The constructed variable was then divided into five quintiles, where the first quintile and the last quintile represented the poorest and the richest socio-economic levels respectively.

## Statistical Analysis

Descriptive statistics (absolute and relative frequencies) were used to describe the distribution of women aged 18 and over with regard to cervical cancer screening practice. To examine the association between socio-demographic characteristics and the cervical cancer screening adherence, the Chi-Squared test was performed. Logistic regression analysis was undertaken for calculating adjusted socio-demographic disparities. To this purpose, the analytic population was restricted to women

aged 30-59 years, for whom cervical cancer screening is recommended in the latest edition of the national guideline. The estimates were analysed by using SPSS version 25, assuming a significance level of a < 0.05.

Concentration curve and concentration index (CI) were used to assess the inequality in cervical cancer screening participation according to the socio-economic status in Iran. The concentration curve plots the cumulative percentage of health outcome (y-axis), against the cumulative percentage of the individuals ranked by socio-economic status (x-axis). The concentration index is measured based on the concentration curve and takes values between -1 and +1. In the case of perfect equality, the curve is a 45° line and the index equals to zero. If the health variable is distributed disproportionately higher among the individuals with higher socio-economic level, the curve lies below the line of equality and the index takes positive values. The curve lies above the line of equality when the health variable is unequally distributed in favour of individuals in lower socio-economic level. In this case the index is negative. [18-20] In this study for the binary health outcome, which was having ever undergone cervical cancer screening or not, the Wagstaff correction was needed in order for concentration index to be measured between -1 and +1.[21] Therefore, inequality analyses were performed considering the Wagstaff correction by using STATA version 15.

The concentration index was also calculated for the provinces of the country. Moreover, to provide more insight of the spatial distribution, Geographic Information System analysis (GIS) was used to visualize the results on the map of Iran.

Since the data was collected by trained in-home interviewers based on a standardized protocol, the proportions of missing values were low. The missing rates ranged between 1% to 5% across all variables in the dataset, therefore the impacts of the missing values on the quality of statistical inferences was regarded as insignificant.[22]

## Results

Data from 15975 participants were analyzed. The characteristics of the study participants are shown in table 1. Most women in our sample were aged 30-39, married, and had elementary education (1-6 years). The majority were residing in urban areas and unemployed. Over ninety percent had basic primary health insurance, yet less than a third were covered under the complementary insurance plan.

Overall, 41.6% of women aged 18 and over reported ever had a cervical cancer screening. The highest proportion was found in women aged 40-49 years. The participation rate for women aged 30-59 years was 52.1%. Women who were married, had 6-12 years of schooling, lived in urban areas, were unemployed, had insurance coverage, and were in lowest socio-economic quintiles, showed greater participation in cervical cancer screening program. All socio-demographic variables were significantly associated with cervical cancer screening in the bivariate analysis, except for the age. (Table 1)

Table 2 shows participation rates in each province as a whole and by urban and rural populations. As shown, highest rates were obtained in the provinces of Isfahan, Fars and Kohgiluyeh and Boyer-Ahmad. In contrast, Sistan and Baluchestan, Hormozgan and Kerman had lowest participation rates. Urban-rural disparity in participation rate was greatest in Khorasan-Razavi and Ilam, while being smallest for Fars and Kohgiluyeh and Boyer-Ahmad.

The results of the multivariate analysis of the factors associated with participation in cervical cancer screening are presented in table 3. Significant positive predictors for having ever had a cervical cancer screening were being in the age range of 40-49 years, having 6-12 years of schooling, being married, and having a basic or a complementary health insurance coverage. Women who were employed or university student, were less likely to participate in cervical cancer screening program. After accounting for other covariates in the model, residing area was no more a significant predictor for cervical cancer screening participation.

Analysis of the cervical cancer participation rates across the socio-economic levels revealed that participation rates were greater among women in lower socio-economic levels as compared to that among those in higher levels. The concentration

index was obtained as  $-0.22$ , indicating that the health service is concentrated in lower socio-economic levels of the society. The corresponding concentration curve is shown in figure 1.

The concentration indices for cervical cancer screening by province are summarized in table 4. The values assigned to provinces ranged from  $-0.02$  to  $-0.54$ . The most unequal provinces in terms of participation in cervical cancer screening were Sistan and Baluchestan, Hormozgan and Kerman. While Ardabil, Tehran and Chahar Mahaal and Bakhtiari were the provinces with the most equal participation. All concentration indices were statistically significant except for Ardabil, Chahar Mahaal and Bakhtiari, Ilam, Kermanshah, and Semnan.

Figure 2 is the map of Iran showing concentration indices, portioned by province. Overall, the map is indicating higher inequality ranges along the eastern provinces of the country, and lower inequality ranges among the west central provinces.

## Discussion

This study showed insufficient cervical cancer screening utilization in Iran. About half of the recommended target population in the national guideline (52.1 %) have reported having had at least one Pap test in their lifetime. Having 6-12 years of schooling, and being covered under primary or complementary health insurance plans were significantly associated with higher participation. Women living in urban settings had greater screening rates across almost all provinces. The highest screening uptake rate was obtained in Isfahan and the lowest in Sistan and Baluchestan. Moreover, this study has added to the small body of literature which has assessed socio-economic equity in cervical cancer screening in Iran. A pro-poor bias was observed across the country in cervical cancer screening participation.

In general, the cervical cancer screening participation rate in Iran was low in comparison with most developed countries. In the United States of America 85.5% of women aged 21-64, in Spain 72% of women aged 25-65, and in Australia 61% of women aged 20-69 had undergone cervical cancer screening in the past three years.[23-25] However, within developing countries, Iran holds an intermediate position. The prevalence of having ever been screened for cervical cancer was 19% in Jordan (in women aged 20-49), 46.3% in Thailand (in women 30 years and above), and 87.1% in Brazil (in women aged 25-64). [26-29] Lack of an organized population-based screening program may underlie the lower participation rate in Iran. The opportunistic approach which has been in place for more than three decades, has failed to reach many at-risk women in the population.

Age was significantly associated with cervical cancer screening participation. The proportion screened increased with age until 40-49-year age group, but then declined in each subsequent age group afterward. This was aligned with other studies in Iran and United States of America.[30, 31] Probably women in their thirties and forties tend to be more informed about cervical cancer and are more likely to visit healthcare providers for gynecological complaints.

As expected, married women were most likely to have undergone cervical screening, which was in line with previous studies. [24, 27] Married women tend to attend healthcare facilities more often for maternal and child health care.

With regards to education level, higher education was associated with higher participation until about 12 years of schooling. This finding is consistent with other study results conducted in Iran, but not with those of other countries.[14, 24] The finding suggests that university education in the country has no impact on raising women's awareness or changing their attitude towards cervical cancer screening.

The present study determined that employment or being a university student were negative predictors for cervical cancer screening practice among women. This finding contradicts similar studies in other countries, yet validates the results of studies conducted in Iran. [14, 32, 33] Having less free time, might be the possible rationalization for this unexpected finding among working women. Furthermore, hours of operation in most healthcare facilities delivering cervical screening services coincide with usual working hours and may act as a barrier for employed women.

In parallel with other studies, women with health insurance coverage were more likely to have undergone cervical screening. [24, 34, 35] Health insurance plans can increase health service utilization by reducing out-of-pocket expenditures and alleviating potential financial barrier to the service uptake. In Iran, the basic health insurance plans cover most cervical cytology screening costs, and complementary plans provide a full coverage of the service fees.

Despite of the considerable success of the Iranian primary health care approach in delivering health services to remote and rural areas of the country in the past three decades, women who resided in rural areas had lower participation in cervical cancer screening program.[36] This may be partly due to the barriers such as negative cultural beliefs around cervical cancer, embarrassment about attending cervical screening, and lack of privacy.[37] Since the screening service is provided by a community health care worker who lives in the same neighborhood. Moreover, the participation rates in rural areas might be more affected by under-reporting due to embarrassment in admitting to have been screened for cervical cancer than in urban settings, where negative beliefs associated with the disease is less common.[15]

This study also revealed evidence of disparities in cervical cancer screening participation across socio-economic groups in Iran. Contradicting with findings in most countries, women with higher socio-economic status had shown lower participation in cervical cancer screening program. [23, 26] However, pro-poor inequality was shown in outpatient healthcare utilization in multiple studies in Iran.[38, 39] Perhaps this finding could be explained by the nature of the health care system In Iran, the primary health care facilities are all publicly owned. Women in lower socio-economic levels routinely visit these facilities for healthcare services such as maternal and child care, which provides opportunities for communication about cervical cancer screening. Whereas, women in higher socio-economic levels often see specialists directly and based on their health complaints. Therefore, preventive services are substantially underutilized by this group.[40]

Regional variations in equity in cervical cancer screening participation could be understood by portioning the concentration index analysis across provinces. Provinces with higher participation rates in cervical cancer screening such as Isfahan (61.2%), and Tehran (51.4%) represented greater equity in cervical cancer participation, - 0.11 and - 0.08 respectively.

The major strength of the study is the use of a large nationally representative sample of rural and urban Iranian women, containing different socio-economic levels, that allowed more confident inferences about the population. However, there are some potential limitations as well. First, the cross-sectional design of the study has limited the ability to draw conclusions about causal relationships. Second, the data on the history of having ever undergone cervical cytology were self-reported, and therefore may be susceptible to *recall* and social desirability *biases*. *Lastly, by evaluating secondary data sources in this study, the assessment of all factors associated with cervical cancer screening participation was not possible.*

## Conclusion

Considering the findings of this study, it can be concluded that participation rate for cervical cancer screening is not optimal in Iran and could be improved. Moreover, with regard to the distribution of cervical cancer screening practice, social and geographical disparities have been determined which indicate the need for further research and more comprehensive strategies in order to reduce them.

## Declarations

### Ethics approval and consent to participate

Ethical approval was obtained from Shahid Beheshti University of Medical Sciences Ethics Committee (Reference number: IR.SBMU.MSP.REC.1398.399, Approval date: 2019-03-12). Participation in the National Survey of The Risk Factors of Non-Communicable Diseases in Iran (STEPs 2016) was voluntary and informed consent were obtained from all participants before enrolling. All data were de-identified prior to analysis.

### Consent for publication

Not applicable.

### **Availability of data and materials**

The data that support the findings of this study are available from National Institute of Health Research (NIHR) but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of National Institute of Health Research (NIHR).

### **Competing interests**

The authors declare that they have no competing interests associated with the material presented in this paper.

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### **Authors' contributions**

RA was the main researcher and involved in study design, literature search, data analysis, data interpretation, article drafting and finalizing the manuscript. AAK was involved in data cleaning, study design, data interpretation and article drafting. NJ and ARA were involved in study design, data interpretation, data analysis and article drafting. MRS was the head of team and involved in study design, literature search, data analysis, data interpretation, article drafting and finalizing the manuscript and is the corresponding author. All authors read and approved the final manuscript.

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Not applicable.

## **Tables**

**Table 1.** Descriptive Statistics of Women aged 18 and above by Cervical Cancer Screening Participation

Sociodemographic variable	n	%	Participation rate %	p-value
<b>Age group</b>				0.05
18-29	3294	21.6	24.9	
30-39	3696	24.2	51.1	
40-49	3016	19.8	55.9	
50-59	2488	16.3	49.1	
60-69	1672	11.0	32.9	
+70	1094	7.2	16.6	
<b>Marital status</b>				<0.001
Single	1967	12.6	1.9	
Married	11554	73.8	50.7	
Widow	1730	11.0	25.4	
Divorced	412	2.6	42.6	
<b>Education</b>				<0.001
Illiterate	3305	21.5	24.4	
1-6 years	5852	38.0	47.4	
6-12 years	3858	25.0	49.1	
>12 years	2387	15.5	39.7	
<b>Employment</b>				<0.001
Unemployed	13262	84.6	42.9	
Employed	1467	9.4	42.7	
Retired	326	2.1	55.4	
Student	622	4.0	5.7	
<b>Primary Insurance</b>				<0.001
No	1035	6.6	32.1	
Yes	14682	93.4	42.3	
<b>Complementary Insurance</b>				<0.001
No	12270	78.7	39.0	
Yes	3312	21.3	51.0	
<b>Residence</b>				<0.001
Urban	11203	70.1	44.7	
Rural	4772	29.9	34.3	
<b>Socio-economic Quintiles</b>				<0.001
Lowest	3195	20.0	53.1	
Low	3195	20.0	47.1	
Middle	3198	20.0	41.6	
High	3194	19.9	32.2	
Highest	3193	19.9	24.8	
<b>Total</b>	15975		41.6	

N, number of women in each category; %, percentage of women in each category; Participation rate, percentage of women in each category who reported undergoing cervical cancer screening; P-value, obtained from cross-tabulation between each category and cervical cancer screening.

**Table 2.** Cervical Cancer Screening Participation of Women aged 18 and above by Province and Urban-Rural Areas.

Province	n	Provincial Participation rate	Urban Participation rate	Rural Participation rate	P-value
Alborz	511	44.4%	45.8%	31.3%	0.054
Ardabil	231	36.8%	40.0%	30.9%	0.169
Bushehr	209	37.8%	42.3%	29.2%	0.062
Chaharmahal and Bakhtiari	330	42.7%	38.8%	48.5%	0.079
East-Azerbaijan	677	34.7%	36.6%	30.7%	0.134
Fars	938	54.8%	55.0%	54.5%	0.884
Gilan	485	43.9%	46.6%	39.6%	0.127
Golestan	304	29.3%	32.1%	26.2%	0.261
Hamadan	344	47.1%	52.4%	39.1%	0.015
Hormozgan	304	25.3%	32.3%	18.1%	0.005
Ilam	231	45.9%	53.6%	34.4%	0.004
Isfahan	985	61.2%	61.1%	62.2%	0.798
Kerman	535	24.5%	32.1%	14.1%	<0.001
Kermanshah	384	44.3%	45.6%	41.5%	0.447
Khorasan-Razavi	1097	37.8%	42.6%	25.6%	<0.001
Khuzestan	799	34.4%	36.3%	30.2%	0.095
Kohgiluyeh and Boyer-Ahmad	275	53.5%	53.8%	53.0%	0.892
Kurdistan	298	37.2%	41.6%	28.1%	0.025
Lorestan	332	35.2%	37.9%	31.0%	0.198
Markazi	276	42.8%	46.2%	33.8%	0.060
Mazandaran	581	44.4%	46.8%	41.7%	0.219
Qazvin	231	52.4%	50.0%	58.0%	0.267
Semnan	247	40.1%	39.2%	43.1%	0.591
Sistan and Baluchestan	409	7.6%	6.8%	8.3%	0.561
South-Khorasan	618	35.4%	39.4%	31.2%	0.033
Tehran	2313	51.4%	51.5%	49.7%	0.634
West-Azerbaijan	578	25.4%	28.0%	20.8%	0.055
Yazd	358	41.3%	41.1%	42.6%	0.823
Zanjan	380	32.6%	36.1%	26.8%	0.059
Total	15260	41.6%	44.7%	34.3%	<0.001

N, number of women interviewed in each province; P-value obtained from Pearson Chi-Square test

**Table 3.** Logistic Regression Model of Independent Variables Associated with Cervical Cancer Screening Participation in Iranian Women

variable	aOR	95% Confidence Interval		p-value
		Lower	Upper	
<b>Age group</b>				
30-39	1			
40-49	1.11	1.118	1.248	0.48
50-59	0.91	0.803	1.035	0.15
<b>Marital status</b>				
Single	1			
Married	45.84	29.460	71.342	<0.001
Widow	30.30	18.723	49.056	<0.001
Divorced	32.82	19.919	54.103	<0.001
<b>Education</b>				
Illiterate	1			
1-6 years	1.76	1.531	2.029	<0.001
6-12 years	2.47	2.088	2.932	<0.001
>12 years	2.24	1.803	2.786	<0.001
<b>Employment</b>				
Unemployed	1			
Employed	.83	.714	.986	0.03
Retired	1.07	.713	1.622	0.72
Student	.92	.423	2.019	0.84
<b>Primary Insurance</b>				
No	1			
Yes	1.50	1.245	1.808	<0.001
<b>Complementary Insurance</b>				
No	1			
Yes	1.21	1.072	1.369	<0.001
<b>Residence</b>				
Urban	1			
Rural	1.08	.969	1.216	0.15
<b>Socio-economic Quintiles</b>				
Lowest	1			
Low	0.76	0.668	0.883	<0.001
Middle	0.72	0.630	0.842	<0.001
High	0.51	0.444	0.604	<0.001
Highest	0.44	0.377	0.528	<0.001
<b>Constant</b>	0.01			<0.001

aOR, adjusted Odds Ratio;

**Table 4.** Concentration Indices for Cervical Cancer Screening Participation, Partitioned by Province.

Province	index value	Std. Error	P-value
Alborz	-.16	.048	<0.001
Ardabil	-.07	.079	0.375
Bushehr	-.25	.078	<0.001
Chaharmahal and Bakhtiari	-.02	.062	0.661
East-Azerbaijan	-.12	.044	0.004
Fars	-.18	.036	<0.001
Gilan	-.19	.051	<0.001
Golestan	-.23	.069	<0.001
Hamadan	-.23	.059	<0.001
Hormozgan	-.37	.069	<0.001
Ilam	-.12	.074	0.096
Isfahan	-.11	.036	0.002
Kerman	-.54	.050	<0.001
Kermanshah	-.09	.057	0.114
Khorasan-Razavi	-.24	.034	<0.001
Khuzestan	-.10	.041	0.016
Kohgiluyeh and Boyer-Ahmad	-.14	.067	0.030
Kurdistan	-.32	.063	<0.001
Lorestan	-.18	.063	0.004
Markazi	-.24	.065	<0.001
Mazandaran	-.21	.045	<0.001
Qazvin	-.14	.072	0.052
Semnan	-.13	.073	0.078
Sistan and Baluchestan	-.25	.108	0.018
South-Khorasan	-.26	.045	<0.001
Tehran	-.08	.023	<0.001
West-Azerbaijan	-.23	.053	<0.001
Yazd	-.16	.058	0.006
Zanjan	-.22	.057	<0.001
Total	-.22	.008	<0.001

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## Figures

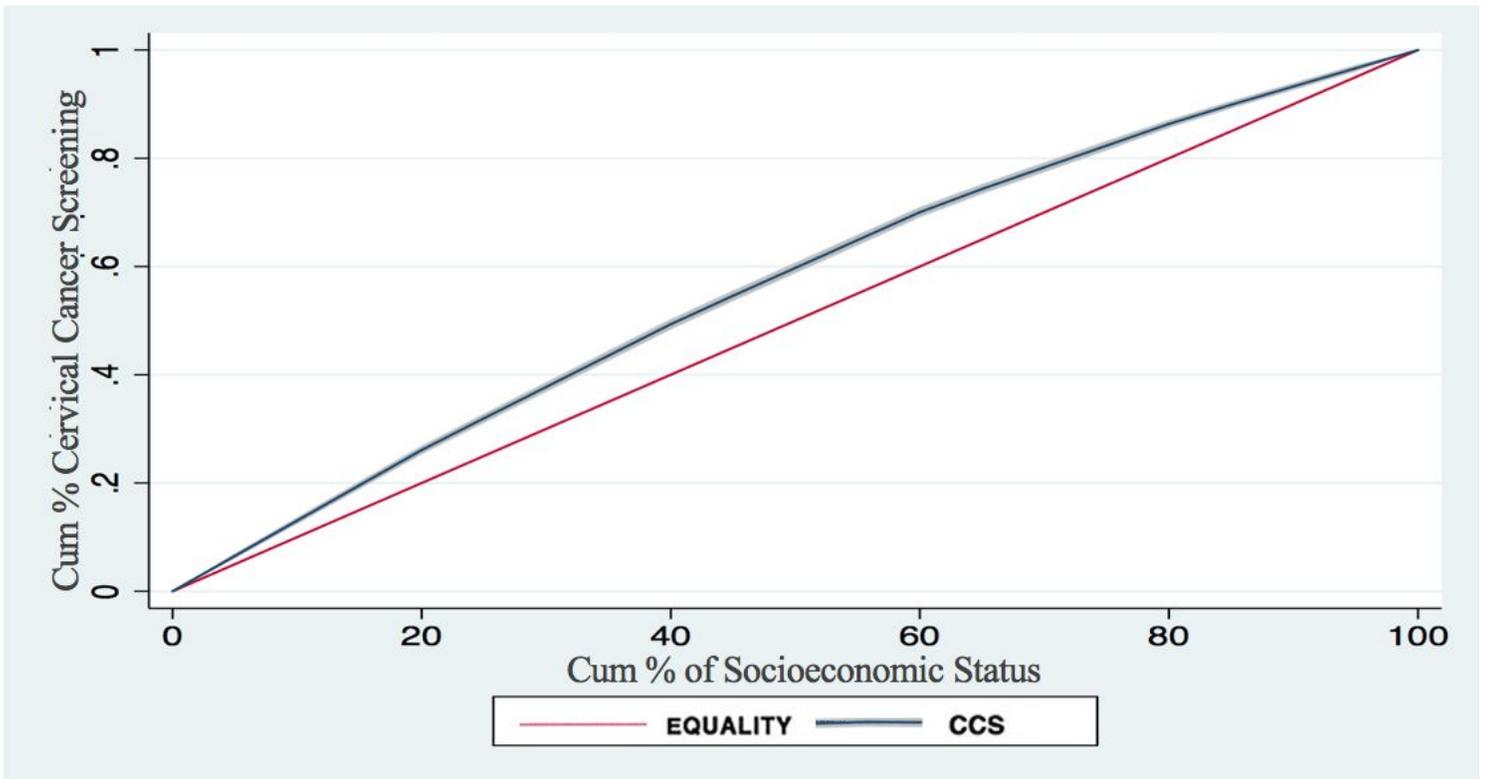
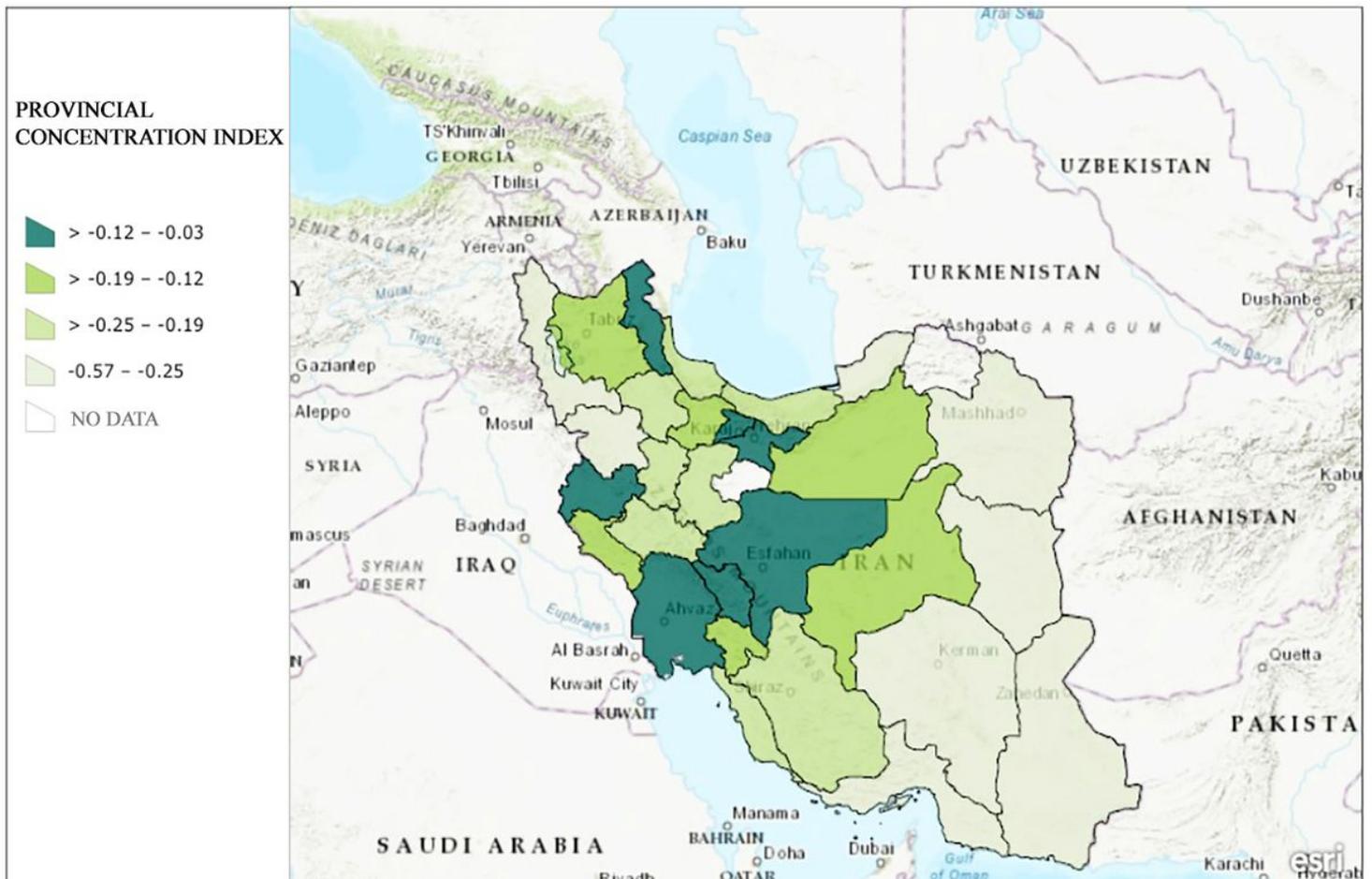


Figure 1

Concentration Curve for Cervical Cancer Screening Participation in Iran.



## Figure 2

Provincial Concentration Index for Cervical Cancer Screening Participation in Iran.

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