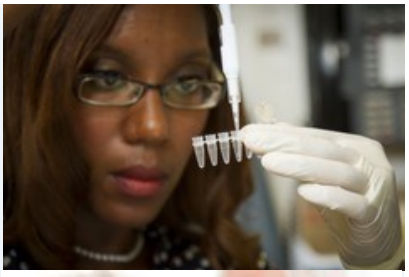

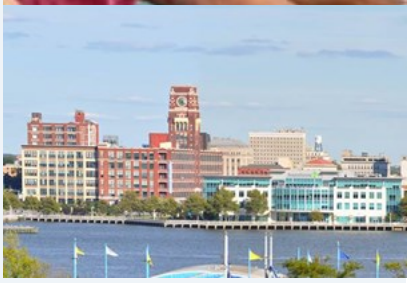

Colorectal Cancer in Screening Age New Jersey Adults

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Fighting cancer with quality data and innovative research

Phil Murphy	Sheila Oliver	Judith M. Persichilli, RN, BSN, MA
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BACKGROUND

Colorectal Cancer Disparities in Screening Age New Jersey Adults

Colorectal cancer (CRC) is the third most commonly diagnosed cancer in both men and women in the United States (U.S.) and in New Jersey.[1,2] Compared to the U.S. average, New Jersey has a slightly higher incidence of CRC (40.8 vs. 38.4 per 100,000; 2013 -2017).[3,4] CRC mortality rates in New Jersey are the same as the U.S. average (13.7 per 100,000; 2014-2018).[3,4]

Colorectal cancer has been linked to many lifestyle-related factors. The links between diet, weight, and exercise and CRC are among the strongest for any type of cancer.[5] A major modifiable risk factor is weight; people who are overweight or obese have a higher risk of developing and dying from CRC.[5] Based on a meta-analysis of prospective cohort studies, in the U.S., individuals with a high body mass index (BMI) were about 46% more likely to develop CRC compared to those with normal BMI values (pooled RR of 1.465 (95% CI, 1.325–1.619)), and those with the highest versus lowest category of waist circumference (WC) had about a 61% higher risk of CRC (pooled RR of 1.612 (95% CI, 1.379–1.885)).[6] The association between BMI and CRC was significantly stronger in men compared to women (pooled RR: 1.467 (95% CI,1.363–1.579) and 1.153 (95% CI, 1.078–1.234), respectively).[6]

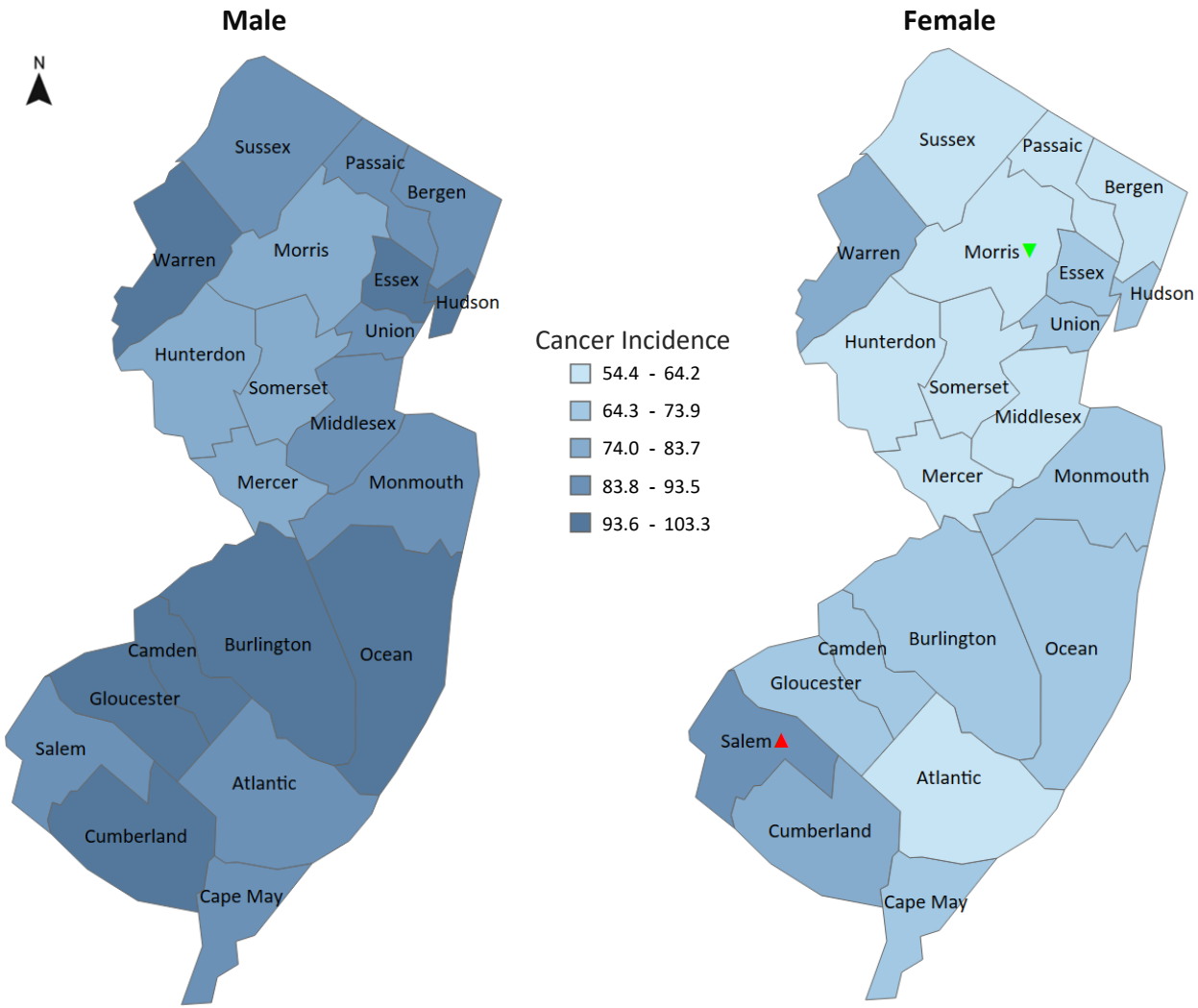
Smoking is also a modifiable risk factor for CRC.[5] A large prospective cohort study found that long term cigarette smoking was associated with an increased risk of CRC.[7] The greatest risk was among current smokers with at least 50 years of smoking, who have a 38% increase in CRC risk compared to never-smokers (hazard ratio: 1.38 (95% CI, 1.04-1.84)).[7]

There are certain CRC risk factors that cannot be changed. These include age, a personal or family history of CRC, inflammatory bowel disease (e.g. Crohn's disease), and having an inherited syndrome (e.g. Lynch syndrome).[5] The risk of CRC increases as people age[5]; about 90% of cases occur in people who are 50 years old or older.[8] CRC in younger adults is rare by comparison. Each year, approximately 10% of New Jersey CRC diagnoses are among residents between the ages 20-49.[2] However, over the past two decades, a subtle yet steadily significant increase in CRC incidence can be seen for younger adult (20-49) men (+1.16% per year; 1995-2014) and women (+1.46% per year; 1995-2014) in New Jersey.[2]

Due to this trend, the American Cancer Society (ACS) has lowered the recommended screening age for CRC from 50 to 45.[9] Increasing access to early CRC screening, which can prevent or successfully treat the cancer, is a public health priority in New Jersey. Among New Jersey screening age adults, 35.6% of men and 34.6% of women report not being up-to-date with CRC screening guidelines[10], proportions which are about 5% higher than the 2020 Healthy New Jersey (HNJ) target.[10] HNJ is the state's health promotion and disease prevention agenda.

This report characterizes colorectal cancer diagnosis and smoking and obesity prevalence among screening age adults by New Jersey county using data from the New Jersey State Cancer Registry (NJSCR) and the New Jersey Behavioral Risk Factor Survey.

Newly Diagnosed Colorectal Cancer in Screening Age Adults



State/County	Male Rate	Male Count	Female Rate	Female Count
New Jersey	91.1	8,519	65.3	6,784
Atlantic	87.0	271	63.1	215
Bergen	85.5	871	60.2	684
Burlington	96.9	479	69.7	384
Camden	93.7	491	72.1	421
Cape May	91.7	126	71.5	106
Cumberland	103.3	160	75.4	127
Essex	99.0	717	72.3	617
Gloucester	96.2	305	67.6	230
Hudson	98.8	548	66.4	415
Hunterdon	74.5	124	56.7	100
Mercer	83.0	310	63.2	260
Middlesex	89.2	743	63.3	565
Monmouth	93.4	683	64.4	505
Morris	82.4	464	▼ 54.4	338
Ocean	98.5	674	70.3	565
Passaic	93.2	453	60.9	337
Salem	85.8	64	▲ 85.9	73
Somerset	79.4	280	58.0	223
Sussex	84.3	156	60.5	114
Union	88.0	480	65.5	394
Warren	93.8	120	80.8	111

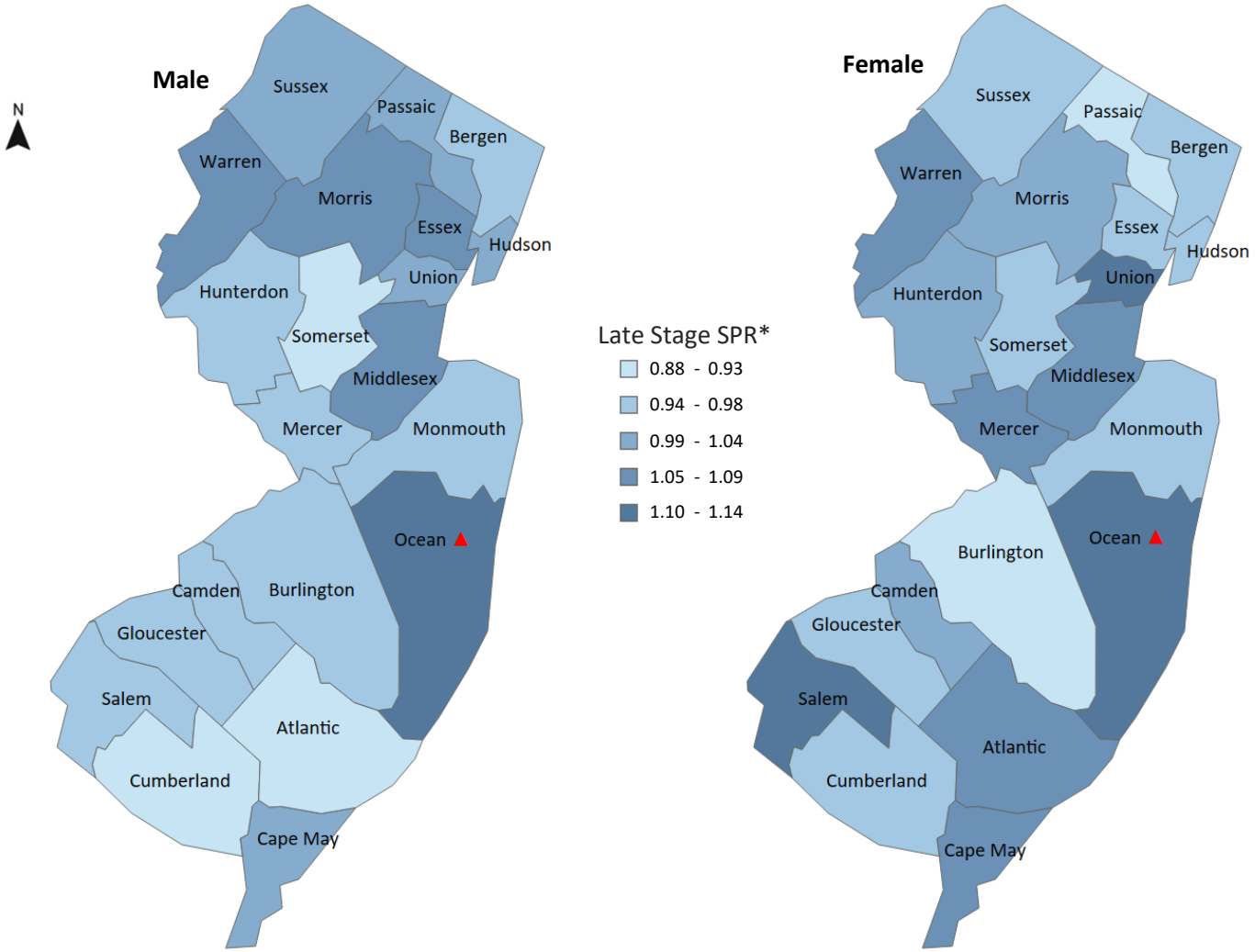
▲ Statistically significantly higher than the statewide rate (p<0.05)

▼ Statistically significantly lower than the statewide rate (p<0.05)

- In New Jersey, rates of new colorectal cancer cases are **higher** in men than in women.
- Rates of new cases are **higher** in southern counties among men and women compared to northern counties.
- Among women with newly diagnosed colorectal cancer, Morris County had significantly **lower** rate and Salem County had significantly **higher** compared to New Jersey women overall.

* Rates are per 100,000 and age-adjusted to the 2000 US population standard. Incidence data are from the New Jersey State Cancer Registry and include invasive colorectal cancers diagnosed during 2012-2017 in adults ages 45-74 years.

Late Stage Colorectal Cancer Diagnosis in Screening Age Adults



State/County	Male SPR*	Female SPR*
New Jersey	1.00	1.00
Atlantic	0.93	1.07
Bergen	0.96	0.93
Burlington	0.94	0.88
Camden	0.94	1.00
Cape May	1.00	1.08
Cumberland	0.90	0.98
Essex	1.05	0.98
Gloucester	0.94	0.95
Hudson	1.03	0.97
Hunterdon	0.94	1.02
Mercer	0.98	1.05
Middlesex	1.05	1.04
Monmouth	0.95	0.98
Morris	1.07	1.01
Ocean	▲ 1.10	▲ 1.14
Passaic	1.01	0.92
Salem	0.96	1.10
Somerset	0.93	0.93
Sussex	1.00	0.97
Union	1.03	1.11
Warren	1.06	1.06

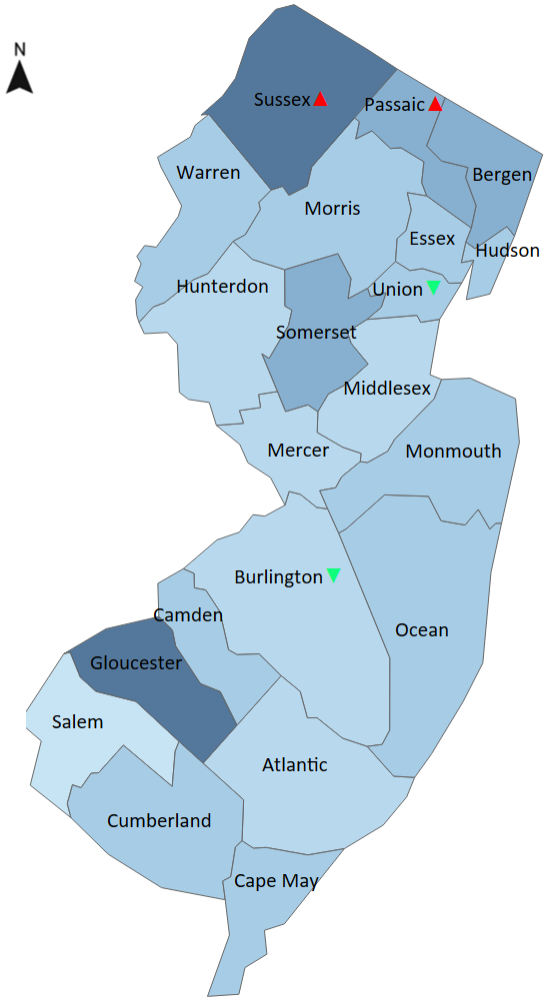
▲ Statistically significantly higher than the statewide proportion ($p < 0.05$)

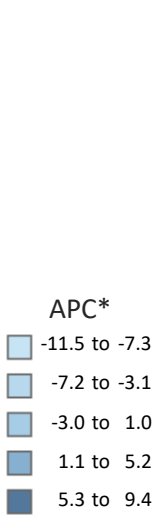
- Both men and women in Ocean County have significantly **higher** (10%+) proportion of late stage colorectal cancer compared to the state.
- For men, the counties with a 5% or **higher** proportion of late stage colorectal cancers compared to the state include Ocean, Warren, Morris, Essex and Middlesex.
- For women, the counties with a 5% or **higher** proportion of late stage colorectal cancers compared to the state include Ocean, Warren, Union, Mercer, Salem, Atlantic and Cape May.

* Standardized Proportion Ratio (SPR) of late stage colorectal cancer cases in each county compared to New Jersey. SPRs can be interpreted as the percentage above or below the reference population's (NJ) SPR of 1.00 or 100%. A SPR of 1.08 represents 8% higher than the New Jersey SPR, while a 0.90 SPR represents 10% lower than the New Jersey SPR. Late stage includes regional and distant stages. The denominator includes all cases (*in situ*, local, regional, distant). Incidence data are from the New Jersey State Cancer Registry and include colorectal cancers diagnosed during 2012-2017 in adults ages 45-74 years.

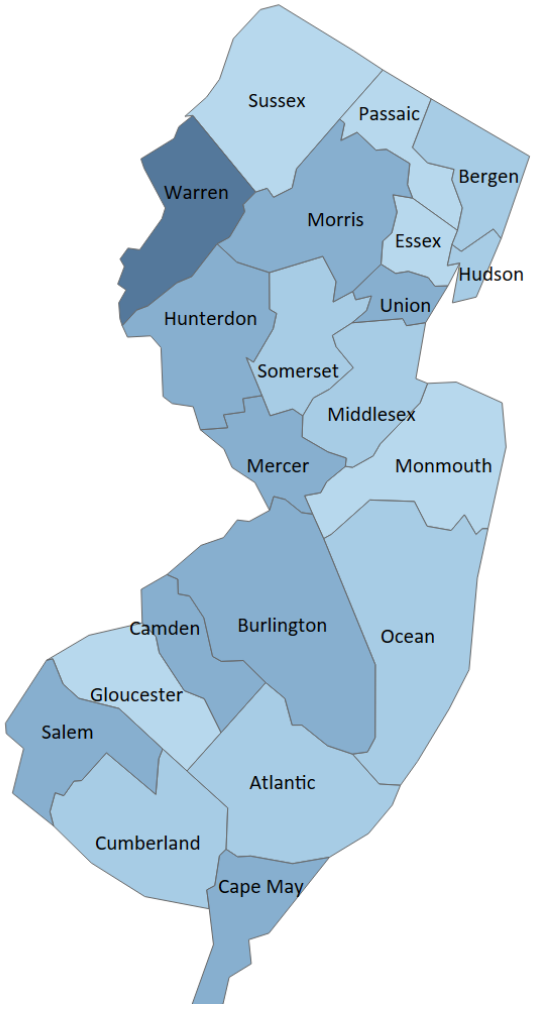
Six Year Trends of Newly Diagnosed Colorectal Cancers in Screening Age Adults

Male





Female



State/ County	Male APC*	Female APC*
New Jersey	-1.0	-0.7
Atlantic	-6.6	0.3
Bergen	1.7	0.5
Burlington	▼-7.1	2.8
Camden	0.2	2.7
Cape May	0.1	3.2
Cumberland	-2.8	-2.4
Essex	-1.6	-4.8
Gloucester	5.6	-3.4
Hudson	-2.8	0.3
Hunterdon	-6.2	1.8
Mercer	-4.7	1.5
Middlesex	-3.6	-0.9
Monmouth	0.8	-3.6
Morris	0.1	3.4
Ocean	-0.3	-3.0
Passaic	▲ 4.5	-4.0
Salem	-11.5	2.7
Somerset	1.9	-3.1
Sussex	▲ 9.4	-3.9
Union	▼-2.9	1.8
Warren	0.0	6.8

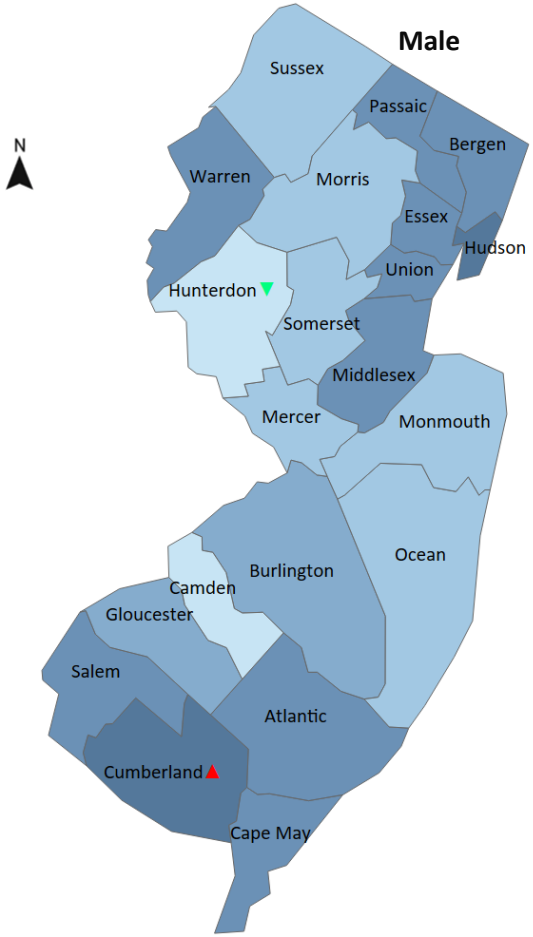
▲ Statistically significantly increasing APC (p<0.05)
▼ Statistically significantly decreasing APC (p<0.05)

- Although overall rates of new colorectal cases among men and women decreased slightly over time in New Jersey, the trends varied widely by county.
- In men, rates of newly diagnosed colorectal cancer **declined** significantly in Burlington and Union counties and i**ncreased** significantly in Passaic and Sussex counties. No significant changes were detected for women for the same time period.

Incidence data are from the New Jersey State Cancer Registry and include invasive colorectal cancers diagnosed during 2012-2017 in adults ages 45-74 years.

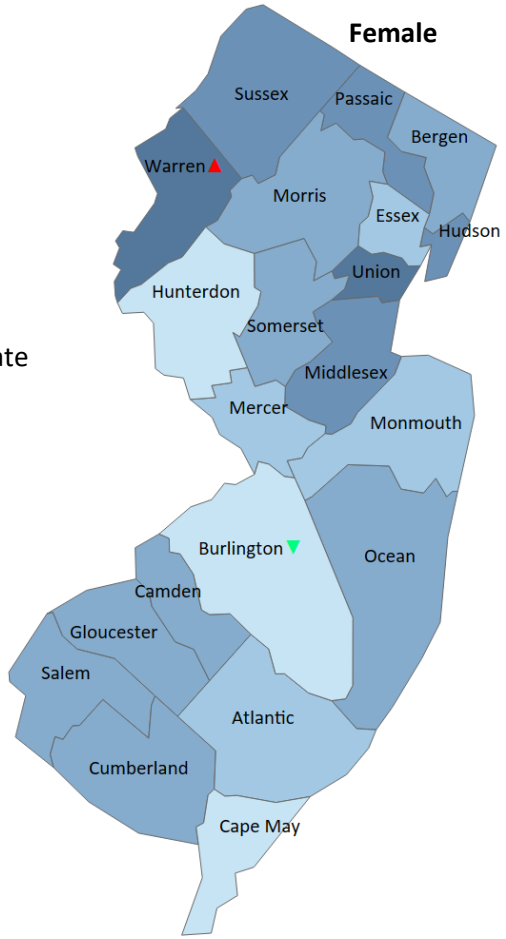
* APC– Annual Percent Change

Percentage of Screening Age Adults Who are Not Up-to-Date with Colorectal Cancer Screening



Percent Not Up-to-Date with Screening

- 26.8 - 30.1
- 30.2 - 33.5
- 33.6 - 36.8
- 36.9 - 40.2
- 40.3 - 43.5



State/ County	Male Percent	Female Percent
New Jersey	35.6	34.6
Atlantic	37.7	33.4
Bergen	38.0	33.5
Burlington	35.5	▼26.8
Camden	28.9	36.0
Cape May	37.6	29.2
Cumberland	▲43.5	35.1
Essex	39.1	30.5
Gloucester	34.5	34.3
Hudson	43.0	37.9
Hunterdon	▼28.6	30.0
Mercer	33.0	31.2
Middlesex	37.8	38.9
Monmouth	30.2	33.0
Morris	31.9	33.7
Ocean	33.1	34.0
Passaic	37.2	38.8
Salem	38.1	35.5
Somerset	30.6	33.7
Sussex	33.0	37.8
Union	37.9	40.4
Warren	38.9	▲41.3

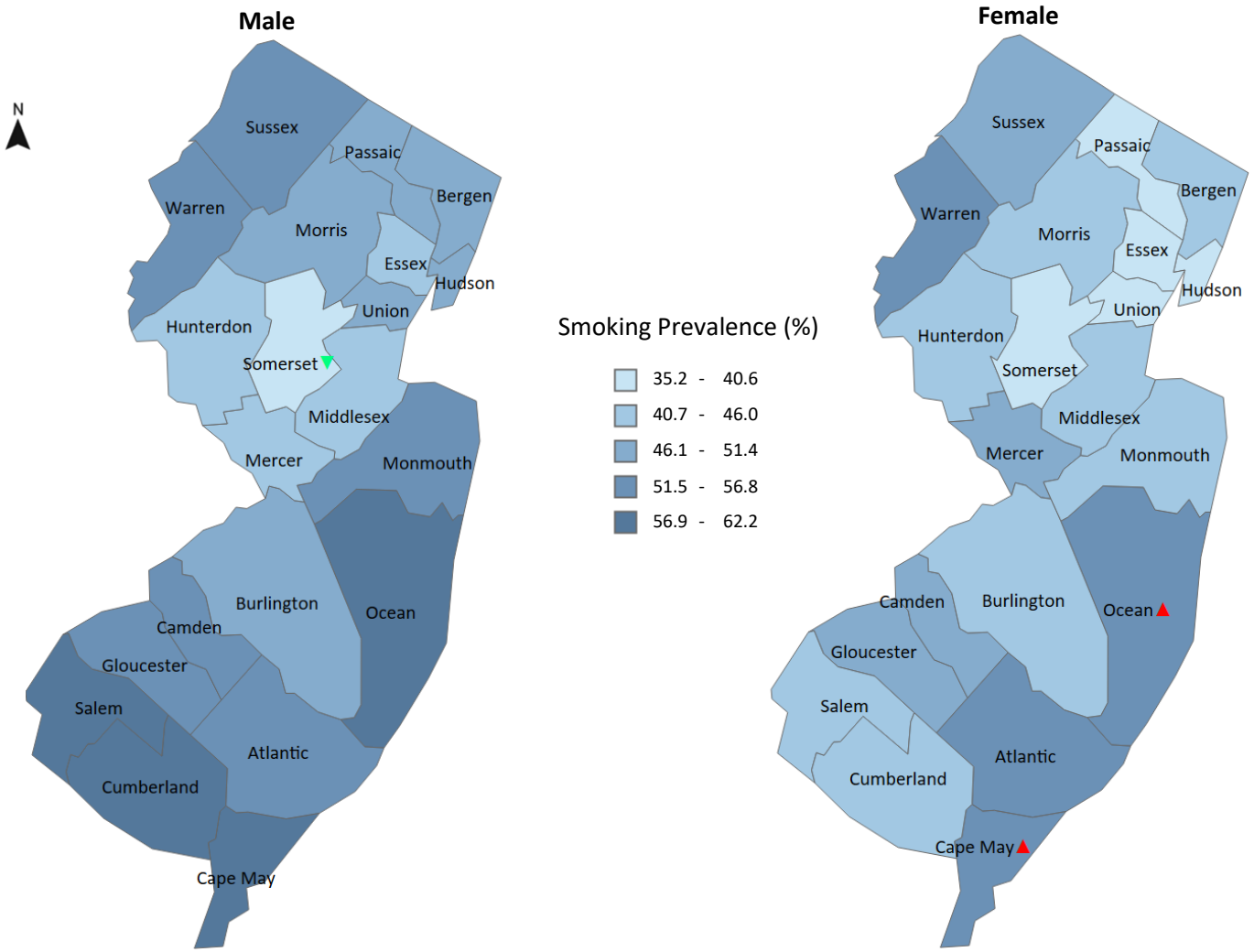
- In the four southern-most counties, men have a **higher** proportion of screening age New Jersey adults who are not up-to-date with their colorectal cancer screening compared to women.
- Compared to all NJ screening age women, there is a significantly **higher** proportion of screening age women in Warren County who are not up-to-date with their colorectal cancer screening, while there is a significantly **lower** proportion of screening age women in Burlington County who are not up-to-date with their colorectal cancer screening.
- Screening age men have a significantly **higher** proportion of not up-to-date colorectal cancer screening in Cumberland County and a significantly **lower** proportion of not up-to-date colorectal cancer screening in Hunterdon County compared to New Jersey screening age men overall.
- Screening age men in Atlantic, Bergen, Cape May, Cumberland, Essex, Hudson, Middlesex, Passaic, Salem, Union and Warren counties have a **high** proportion (37% or above) of not up-to-date with colorectal cancer screening.
- Although not significantly higher than the state average, screening age women in Hudson, Middlesex, Passaic, Sussex and Union counties have a **high** proportion (37% or above) of not up-to-date with colorectal cancer screening.

▲ Statistically significantly higher than the statewide percentage (p<0.05)

▼ Statistically significantly lower than the statewide percentage p<0.05)

Screening data are from the 2012, 2014-2017 New Jersey New Jersey Behavioral Risk Factor Survey presented as percentages (not age-adjusted) of adults aged 50-75 who reported not being up-to-date with either a colonoscopy, sigmoidoscopy, or fecal occult blood test per screening guidelines.

Smoking Prevalence in Screening Age Adults



State/ County	Male Percent	Female Percent
New Jersey	49.8	43.7
Atlantic	54.2	52.4
Bergen	49.2	42.6
Burlington	49.2	43.8
Camden	56.2	46.2
Cape May	58.0	▲ 56.5
Cumberland	57.1	45.8
Essex	45.7	38.7
Gloucester	51.8	50.8
Hudson	48.3	38.1
Hunterdon	45.2	41.1
Mercer	45.6	46.4
Middlesex	44.9	40.7
Monmouth	51.6	45.9
Morris	49.9	41.5
Ocean	60.4	▲ 56.0
Passaic	48.5	37.7
Salem	62.2	45.7
Somerset	▼ 38.7	35.2
Sussex	52.2	46.4
Union	49.6	39.3
Warren	52.3	51.6

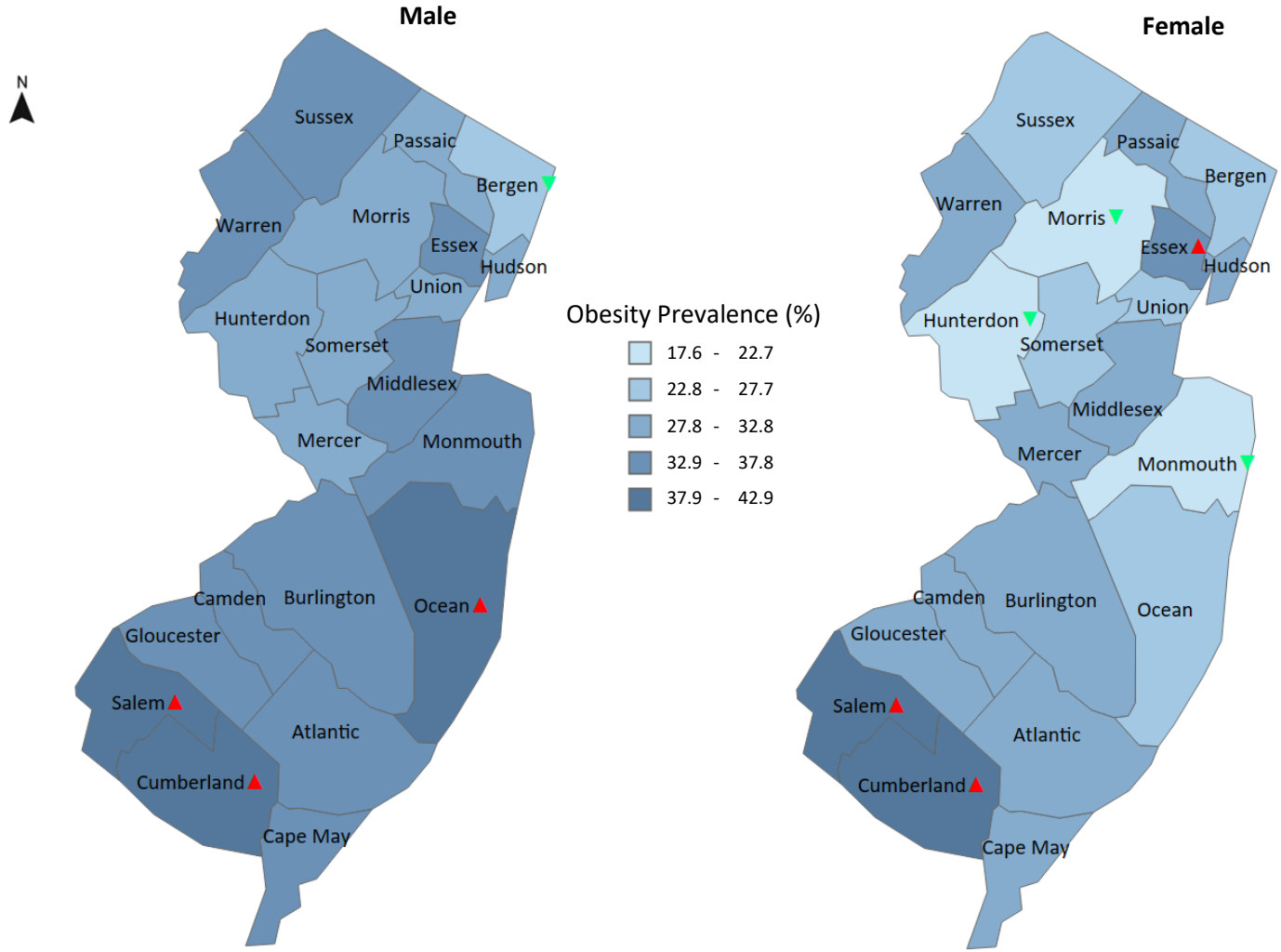
▲ Statistically significantly higher than the statewide rate (p<0.05)

▼ Statistically significantly lower than the statewide rate (p<0.05)

- By displaying smoking prevalence by county we can evaluate how this risk factor relates to colorectal cancer.
- Overall, men have a **higher** smoking prevalence than women.
- Men in Cape May, Cumberland, Ocean, and Salem counties have the **highest** smoking prevalence in New Jersey.
- Compared to the statewide average, women in Cape May and Ocean counties have significantly **higher** smoking prevalence and men in Somerset County have significantly **lower** smoking prevalence.
- Smoking prevalence is **lowest** (below 46%) in Essex, Hunterdon, Middlesex and Somerset counties for both men and women.

Smoking prevalence data are from 2012-2017 New Jersey Behavioral Risk Factor Survey presented as percentages (not age-adjusted) of adults aged 45-75 and include current and former smokers. Current smoker is defined as someone who now smokes "every day" or "some days". Former smoker is defined as someone who does not smoke "at all" now, but had smoked at least 100 cigarettes in their entire life.

Obesity Prevalence in Screening Age Adults



State/ County	Male Percent	Female Percent
New Jersey	32.9	31.9
Atlantic	35.8	30.5
Bergen	▼ 25.3	24.2
Burlington	33.8	32.2
Camden	37.5	32.0
Cape May	37.0	30.0
Cumberland	▲ 41.2	▲ 40.4
Essex	34.6	▲ 34.0
Gloucester	37.2	32.0
Hudson	31.3	30.4
Hunterdon	28.2	▼ 18.6
Mercer	28.5	31.6
Middlesex	36.1	28.9
Monmouth	34.6	▼ 21.9
Morris	27.9	▼ 17.6
Ocean	▲ 42.9	26.7
Passaic	29.2	32.7
Salem	▲ 40.3	▲ 40.2
Somerset	28.6	24.8
Sussex	34.7	26.9
Union	29.8	25.9
Warren	35.4	30.4

▲ Statistically significantly higher than the statewide rate (p<0.05)

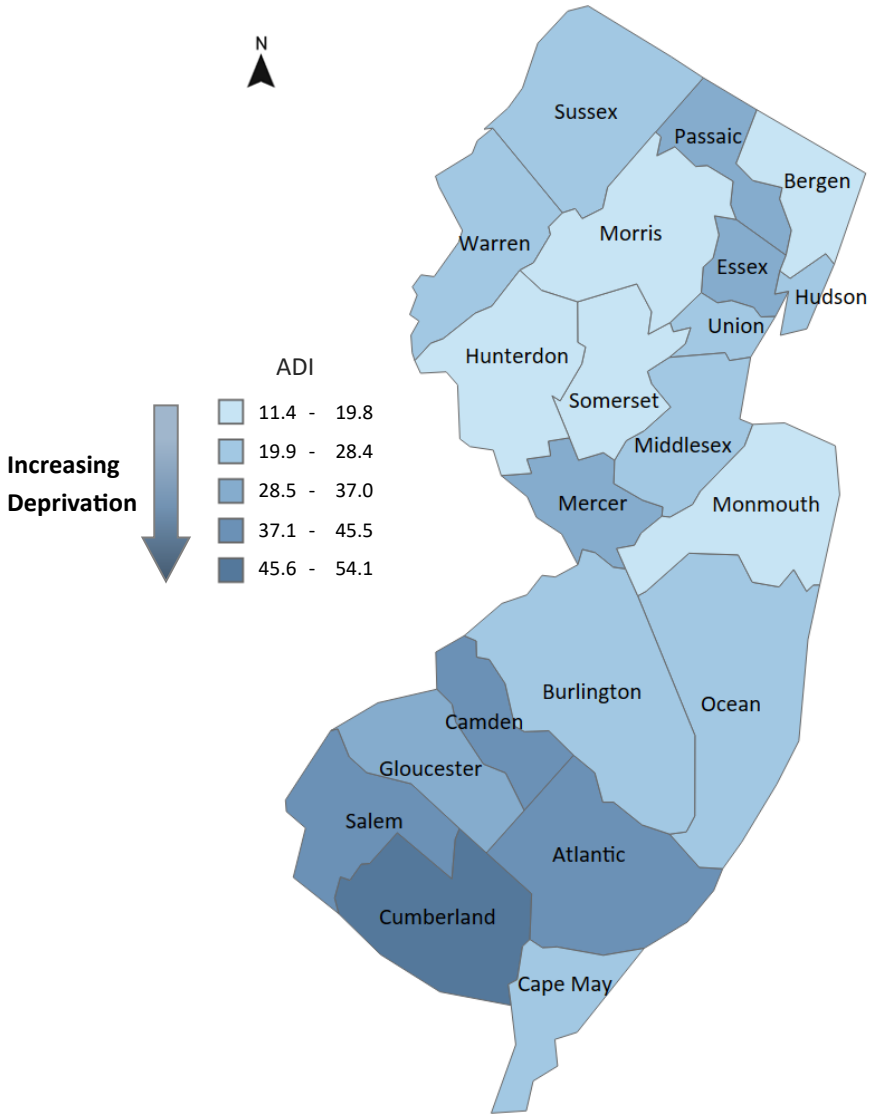
▼ Statistically significantly lower than the statewide rate (p<0.05)

- By displaying obesity prevalence by county we can evaluate how this risk factor relates to colorectal cancer.
- Overall, men have a **higher** obesity prevalence than women in New Jersey.
- There is a significantly **higher** obesity prevalence in Ocean, Salem and Cumberland counties for men and in Essex, Salem and Cumberland counties for women compared to New Jersey.
- There is a significantly **lower** obesity prevalence in Bergen County for men, and Hunterdon, Morris, and Monmouth counties for women compared to New Jersey.

Obesity prevalence data are from 2012-2017 New Jersey Behavioral Risk Factor Survey presented as percentages (not age-adjusted) of adults aged 45-75.

Area Deprivation Index (ADI) by County

- By reviewing the variation in ADI rankings by county we can evaluate how socioeconomic status relates to colorectal cancer.
- Cumberland, Atlantic, Camden, and Salem counties have the **highest** level of area deprivation in New Jersey (above the 37th percentile).
- Individuals living in Cumberland County have the **highest** level of deprivation; Cumberland County also has the **highest** rates of newly-diagnosed CRC cases among men, and is one of the counties with both the **highest** smoking prevalence for men, and the **highest** obesity prevalence for men and women.
- Hunterdon, Morris, and Somerset counties have the **lowest** area deprivation in New Jersey and are among the counties with the **lowest** rates of new CRC cases.



County	ADI
Atlantic	39.0
Bergen	14.5
Burlington	28.3
Camden	42.0
Cape May	25.5
Cumberland	54.1
Essex	33.3
Gloucester	30.8
Hudson	26.8
Hunterdon	11.4
Mercer	30.7
Middlesex	26.0
Monmouth	16.3
Morris	11.9
Ocean	27.5
Passaic	30.5
Salem	41.2
Somerset	13.5
Sussex	21.2
Union	24.5
Warren	27.8

The ADIs are national percentile rankings (from 1 to 100) of socioeconomic deprivation at the census block group level. The percentiles are constructed by ranking the ADI from low to high for the U.S. We calculated the county rankings from the census block group rankings. The census block group ADI data for N.J. were downloaded from the Neighborhood Atlas website, https://www.neighborhoodatlas.medicine.wisc.edu/.

CONCLUSIONS

Colorectal Cancer Disparities in Screening Age New Jersey Adults

Despite the declining trends in colorectal cancer statewide, there are at least a third (35%) of New Jerseyans who are not up-to-date with colorectal cancer screening. Colorectal cancer incidence, and the prevalence of obesity and smoking is higher in men compared to women in New Jersey. Area deprivation and colorectal cancer incidence are higher in South Jersey as compared to North Jersey.

Substantial geographic variation in colorectal cancer incidence and key risk factors in New Jersey are evident. Although South Jersey has the highest incidence rates of colorectal cancer, several northern counties are at increased risk including Sussex and Passaic counties, which are experiencing an increasing trend in newly diagnosed colorectal cancers among men. Warren is among the northern counties with the highest proportion of late stage colorectal cancer, the highest smoking prevalence, and is among the counties that have high proportions who are not up-to-date with screening, particularly women. In the south, Ocean County has the highest proportion of late stage diagnoses and one of the highest smoking prevalence and obesity rates among men in the state. Salem is one of the counties with a high ADI, high obesity prevalence, highest smoking prevalence among men, higher proportion of late stage colorectal cancer compared to the state among women, and is among the counties with the highest proportion of men who are not up-to-date with their colorectal cancer screening. Unique to all of New Jersey counties, Cumberland County, which has the highest area deprivation (greatest socioeconomic deprivation), also has a number of colorectal cancer risk factors including the highest incidence among men (and one of the highest among women), the highest percentage of men who are not up-to-date with colorectal cancer screening, the fourth highest smoking prevalence among men, and higher rates of obesity for men and women.

Counties with the lowest area deprivation (or high socioeconomic status) are the same counties with some of the lowest incidence rates (Morris women), prevalence of smoking (Somerset men), obesity (Bergen men and Hunterdon, Morris, and Monmouth women), and proportion of individuals who are not up-to-date with colorectal cancer screening (Hunterdon men).

These findings are consistent with previous research. Analysis of a large U.S. prospective cohort study found an inverse association between socioeconomic status and CRC risk after controlling for behavioral and other risk factors.[11] Cohort members residing in the most deprived neighborhoods had a 16% increase in CRC risk compared to cohort members residing in the least deprived neighborhoods (Incidence Rate Ratio: 1.16 (95% CI, 1.05-1.28)).[11] Recent research has found that individuals either residing in areas of greater deprivation[12] or with low individual-level socioeconomic status measures[13] have lower CRC screening rates than individuals residing in less deprived areas or individuals with higher individual-level socioeconomic status, respectively, and that increasing screening among those with low individual-level socioeconomic status may result in reduced risk of CRC incidence and mortality.[13]

These data provide evidence to inform cancer control programs, including those that focus on cancer screenings, tobacco cessation, and healthy lifestyle promotion.

Colorectal Cancer Disparities in Screening Age New Jersey Adults

Data Sources

- New Jersey incidence data for this report were derived from the NJSCR December 2019 file. This report includes colon and rectum cancer cases diagnosed from 2012-2017 in adults ages 45-74 years. Colon and rectum cancer is defined by the topography codes C180-C209 as detailed in the International Classification of Diseases for Oncology (ICD-O) third edition.
- Colorectal cancer screening, obesity, and smoking data were obtained from the New Jersey Behavioral Risk Factor Survey (NJBRFS): New Jersey Department of Health, Center for Health Statistics, New Jersey State Health Assessment Data (NJSHAD), accessed at http://nj.gov/health/shad on 6/4/2021.[14] This report includes ages 45-75 for smoking and obesity percentages and ages 50-75 for CRC screening percentages which were based on available data. The estimated percentages have been produced by weighting the sample so that the results better represent the New Jersey population and to adjust for the probability of selection. The years of data used for this report includes 2012-2017 with an exception for CRC screening data in which 2013 was not available in NJBRFS. Adults are defined as having met the U.S. Preventive Services Task Force (USPSTF) Guidelines for colorectal cancer screening if they fall into any of the following categories based on their responses to survey questions: (1) Fecal Occult Blood Test (FOBT) annually, (2) colonoscopy every 10 years, or (3) sigmoidoscopy every 5 years with FOBT every 3 years. After publication of this report, the US Preventive Services Task Force updated their recommendations to start screening at age 45 (as the ACS guideline does) (https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/colorectal-cancer-screening).[15]
- The Area Deprivation Index (ADI) are national percentile rankings (from 1 to 100) of socioeconomic deprivation at the census block group level. The percentiles are constructed by ranking the ADI from low to high for the U.S. and grouping the block groups into bins corresponding to each 1% range of the ADI. Group 1 is the lowest ADI and group 100 is the highest ADI. The ADI was first developed by the U.S. Health Resources & Services Administration to measure socioeconomic deprivation at the county level using 1990 census data. The ADI used in this report was developed by Singh[16] and updated to include 2013 American Community Survey data at the census block group level by Kind[17] at the University of Wisconsin. It is based on 17 census tract level measures of education, employment, occupation, income, housing characteristics, and poverty. The census block group ADI data for N.J. were downloaded from the Neighborhood Atlas website, https://www.neighborhoodatlas.medicine.wisc.edu/ .[18,19] We calculated the county rankings from the census block group rankings.

Software

- Data analyses were conducted using SEER*Stat version 8.3.6 and Tableau 2020.3.

Methods

- Cancer rates are per 100,000 and age-adjusted to the 2000 US population standard. Percentages for NJBRFS data (CRC screening, smoking and obesity) were not age-adjusted.
- The annual percent change is statistically significant at $p < 0.05$.
- The standardized proportion ratio displays the burden of late stage (regional and distant) lung cancer cases in each county compared to New Jersey. Total number of cases include *in situ,* local, regional, and distant stage. Because unstaged cases were not used for the standardized proportion ratio calculation, caution is advised when interpreting the results.
- Map legend categories were created using equal intervals for the complete range of data for males and females and then applying breakpoints to male and female data separately.
- The NJSCR Data Guidelines containing comprehensive data analysis methods and additional information on standardized proportional ratio (SPR) analysis and annual percent change (APC) for trend analysis can be found at https://nj.gov/health/ces/reports.shtml.
- 95% confidence intervals were used to access which counties were statistically different from New Jersey which is symbolically displayed on the maps. Interpretations of which counties are significantly higher or lower are based on the comparison to the New Jersey average.
- Healthy NJ 2020 screening target was based on ages 50-75 and our estimates are based on ages 45-75 which represent the updated American Cancer Society (ACS) recommended screening ages. These data should be interpreted with caution.

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