Ecological Study of the Incidence and Prevalence of Cancer Associated with Social Determinants of Health

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Study Summary

Study Question:
What is the association between social determinants of health (SDoH) and the incidence and prevalence of cancer among US patients?

Study Design:
County-level prevalence and incidence of cancer were calculated in 2021 and linked to SDoH data to examine the potential influence of SDoH on rates of malignancy.

Study Results:

County-Level Prevalence Rate, per 1000

County-Level Incidence Rate, per 1000
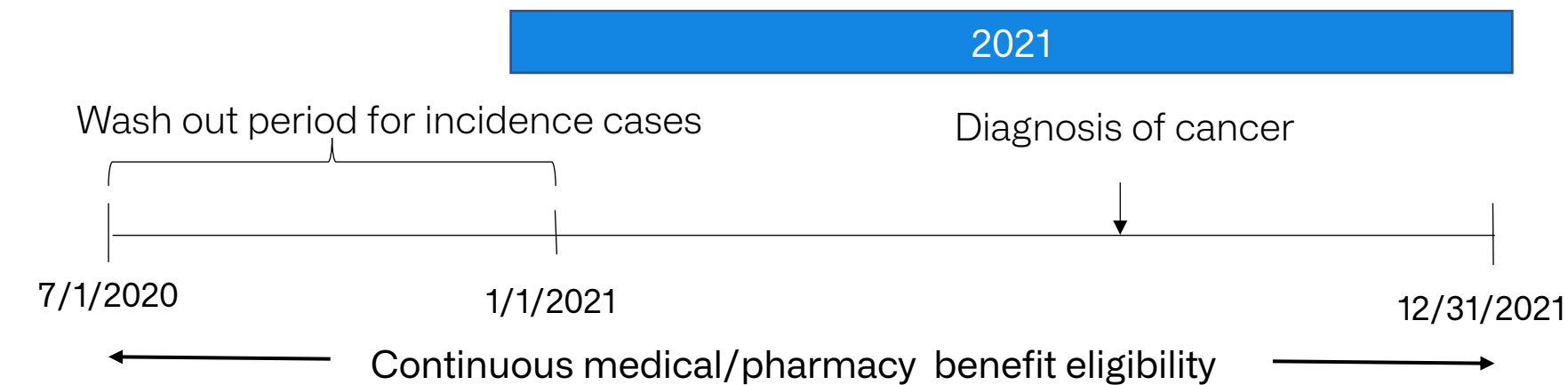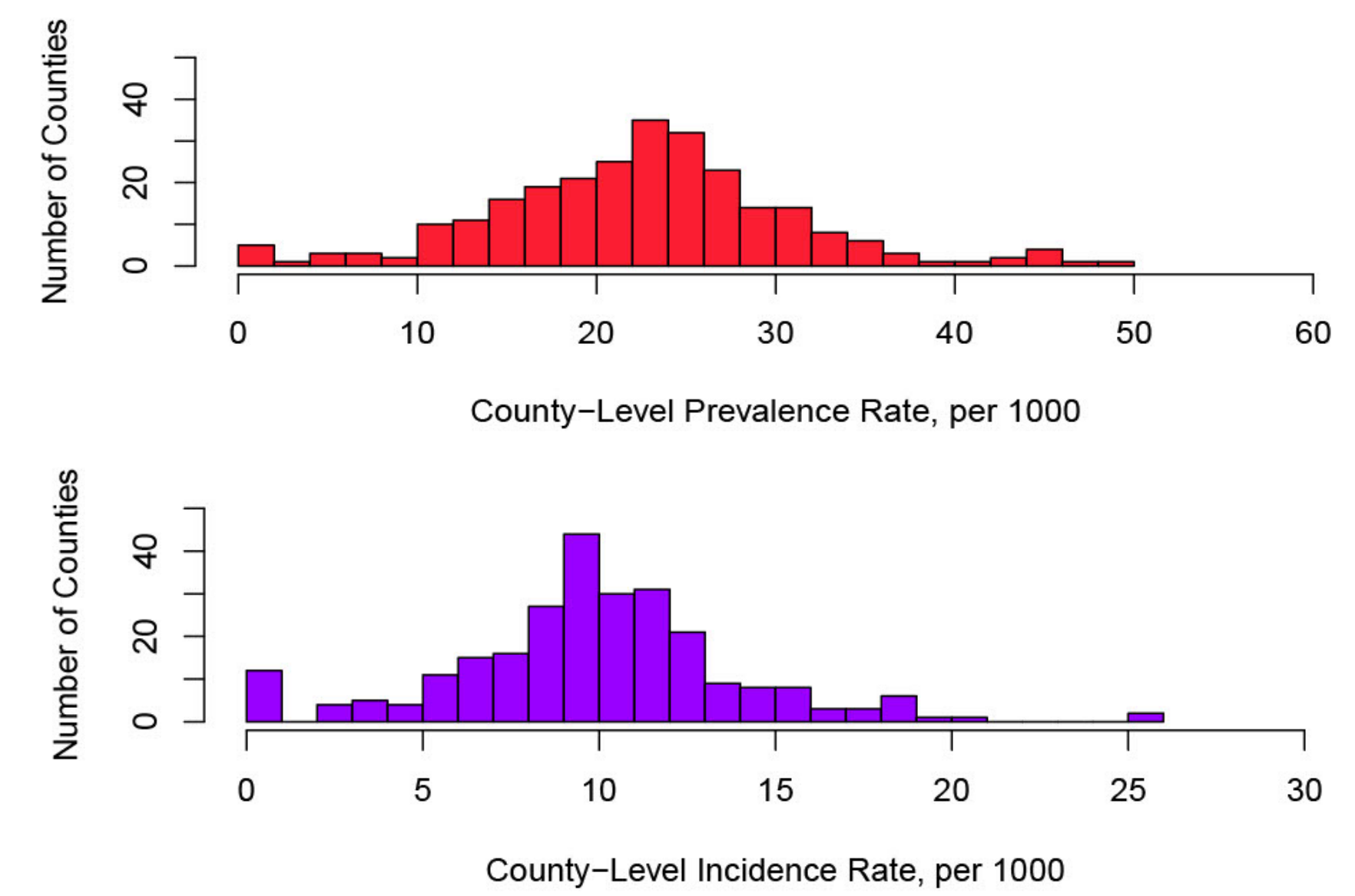
Conclusion:
Various environmental factors, including health behaviors and social factors may influence population risk of cancer.

Background

- Cancer is a leading cause of death in the US and cancer disparities persistently exist in socially, economically, or geographically disadvantaged groups. [1-3]
- Health disparities arise from social-structural factors that extend beyond genetics, and socio-behavioral factors such as smoking, excessive alcohol consumption, lack of physical activity, dietary habits, and obesity have been implicated in the etiology of many cancers. [4,5]
- Social determinants of health (SDoH) are becoming an increasingly important focus in healthcare practice, policy, and research as researchers seek to gain greater understanding the role of SDoH to help enhance health equity in practice, research, and policy.

Objective

- To investigate the relationship between SDoH factors and county-level cancer incidence and prevalence in the US.

Methods

Data Sources

- The Merative™ MarketScan® Commercial and Medicare Database from 7/1/2020 through 12/31/2021
  - This administrative claims databases contain data on the full healthcare experience for individuals with employer sponsored commercial or Medicare insurance.
- The Robert Woods Johnson Foundation County Health Rankings (RWJF) Database which offers access to measures of county-level health outcomes such as mortality and morbidity, as well as SDoH, including health behaviors, clinical care, social and economic factors, and physical environment across the US.

Study Design

- The study sample (denominator) was composed of patients with continuous medical and pharmacy eligibility during the full study period (7/1/2020 through 12/31/2021)
- Patients with ≥1 non-diagnostic claim with ICD-10 CM cancer diagnosis codes between 1/1/2021 and 12/31/2021 were identified (numerator).
- Cancer incidence and prevalence rates for each county were calculated by dividing the number of cancer patients by the total eligible population.
- County-level SDoH data were linked to county-level cancer incidence and prevalence rates and the association between cancer incidence/prevalence and SDoH variables at the county level was examined using multivariate linear regressions. Final models included all SDoH variables that were significant in the fully-adjusted models.
- Only counties with a more than 100 eligible insured individuals were included in the analyses.

Results

Study Samples

- A total of 139,639,753 patients in 261 counties had continuous eligibility for all 18-months of the study and were eligible for the denominator population (Figure 1)
- Among patients eligible for the prevalence analysis :
  - Sex distributions were similar (48.2% vs. 51.8%), with a very slight trend for increased proportions of women
  - Consistent with the overall population in the MarketScan Databases, patients were most likely to reside in the South, followed by the North Central region, the West and then the Northeast
  - The mean age of the overall sample was 38.4; however, standard deviations was large
  - Most of the sample was commercially insured, with fewer than 10% of patients having Medicare coverage
- The sample of patients eligible for the incident analyses included 13,335,347 patients in 261 counties
  - Demographics for the incident eligible analyses were similar to the patients eligible for prevalent analyses, except they were slightly younger, with a mean age of 37.8 years (Table 1)
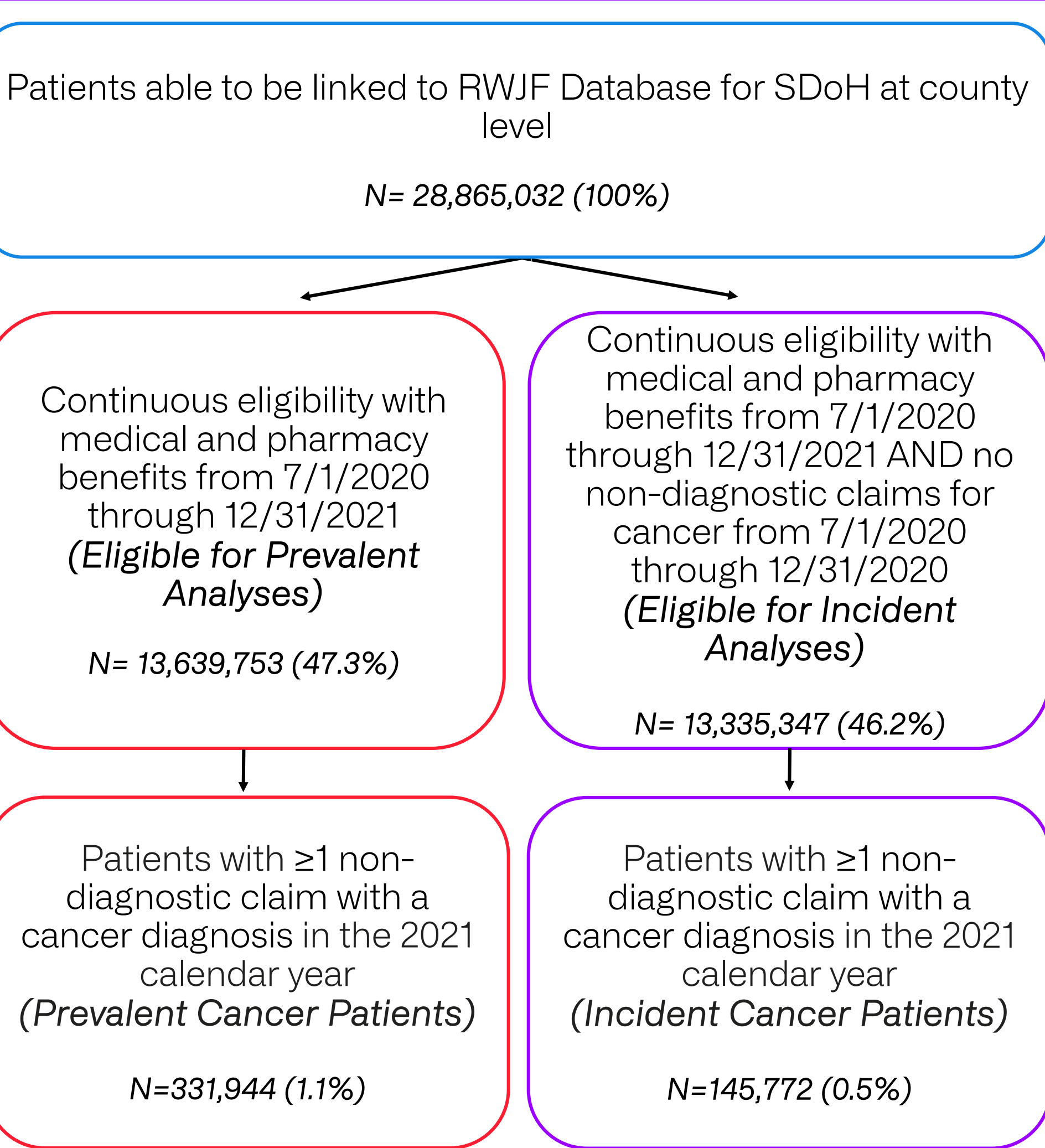
Figure 1. Study Attrition

Patients able to be linked to RWJF Database for SDoH at county level
N= 28,865,032 (100%)

Continuous eligibility with medical and pharmacy benefits from 7/1/2020 through 12/31/2021
(Eligible for Prevalent Analyses)
N= 13,639,753 (47.3%)

Continuous eligibility with medical and pharmacy benefits from 7/1/2020 through 12/31/2021 AND no non-diagnostic claims for cancer from 7/1/2020 through 12/31/2020
(Eligible for Incident Analyses)
N= 13,335,347 (46.2%)

Patients with ≥1 non-diagnostic claim with a cancer diagnosis in the 2021 calendar year
(Prevalent Cancer Patients)
N=331,944 (1.1%)

Patients with ≥1 non-diagnostic claim with a cancer diagnosis in the 2021 calendar year
(Incident Cancer Patients)
N=145,772 (0.5%)

Table 1. Patient Demographics

	Eligible for Prevalent Analyses (N=13,639,753)		Eligible for Incident Analyses (N=13,335,347)	
	N/Mean	%/SD	N/Mean	%/SD
Age	38.4	22.0	37.8	21.8
Male	6,570,849	48.2%	6,428,869	48.2%
Region				
Northeast	1,862,681	13.7%	1,823,006	13.7%
North Central	3,398,888	24.9%	3,314,101	24.9%
South	6,016,284	44.1%	5,882,469	44.1%
West	2,332,037	17.1%	2,286,559	17.1%
Unknown	29,863	0.5%	29,212	0.2%
Payer Type				
Commercial	12,626,616	92.6%	12,355,597	92.7%
Medicare	1,013,137	7.4%	979,750	7.3%

Results

Cancer Prevalence and Incidence

- Overall prevalence of cancer was 24.34 per 1,000 and county prevalence of cancer demonstrated a normal distribution (Summary Figure)
- Incidence of cancer was slightly lower at 10.93 per 1,000; again, county incidence of cancer largely demonstrated a normal distribution (Summary Figure)

Impacts of SDoH on cancer incidence/prevalence

- Counties with a higher percentage of excessive drinking, drug overdose, insufficient sleep, and food security significantly predicted a higher incidence of cancer at the county level (Figure 2)
- Along with excessive drinking and insufficient sleep, a higher percentage of low birthweight infants, longer life expectancy and higher median household income also significantly predicted a higher prevalence of cancer at the county level (Figure 3)

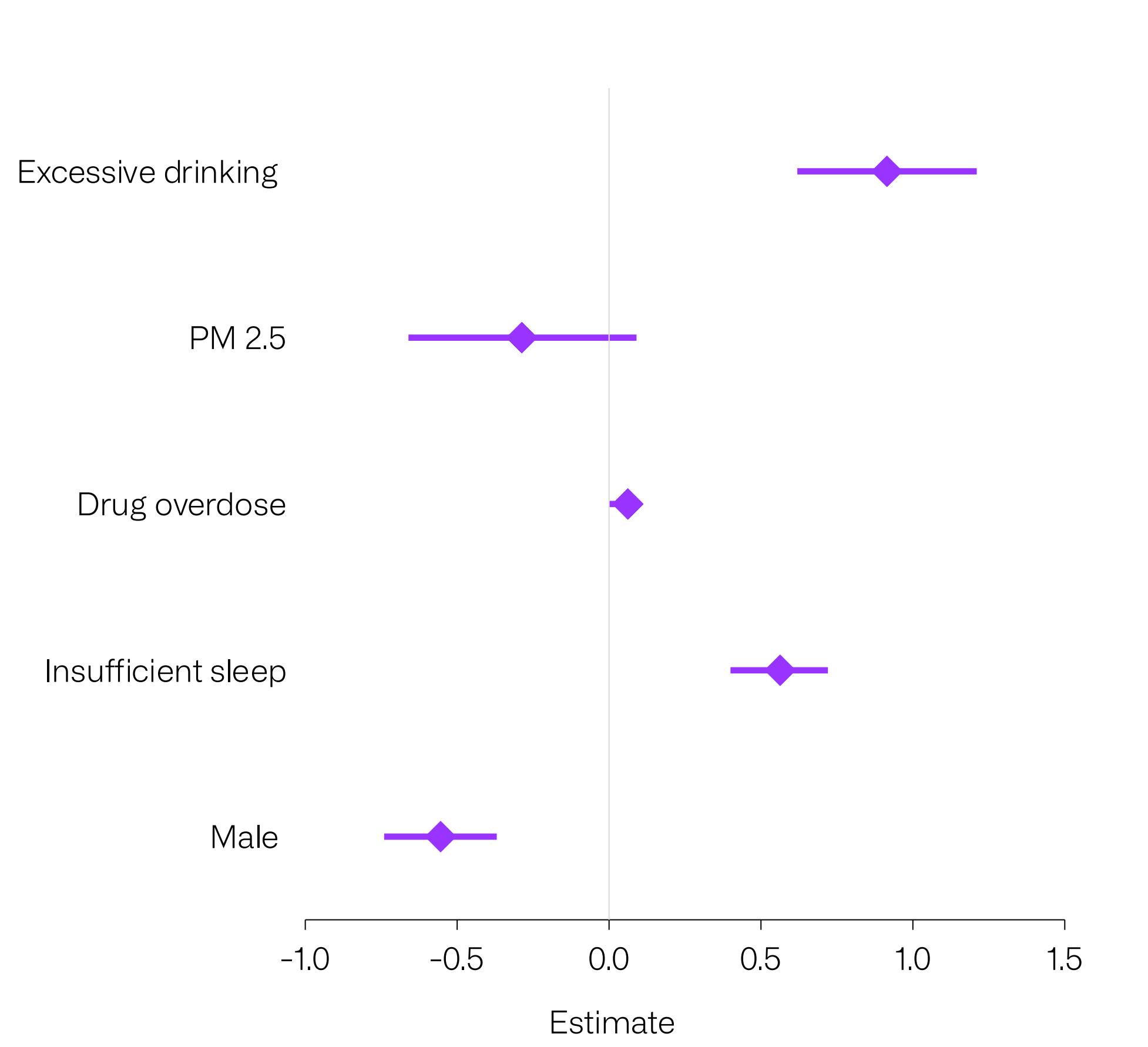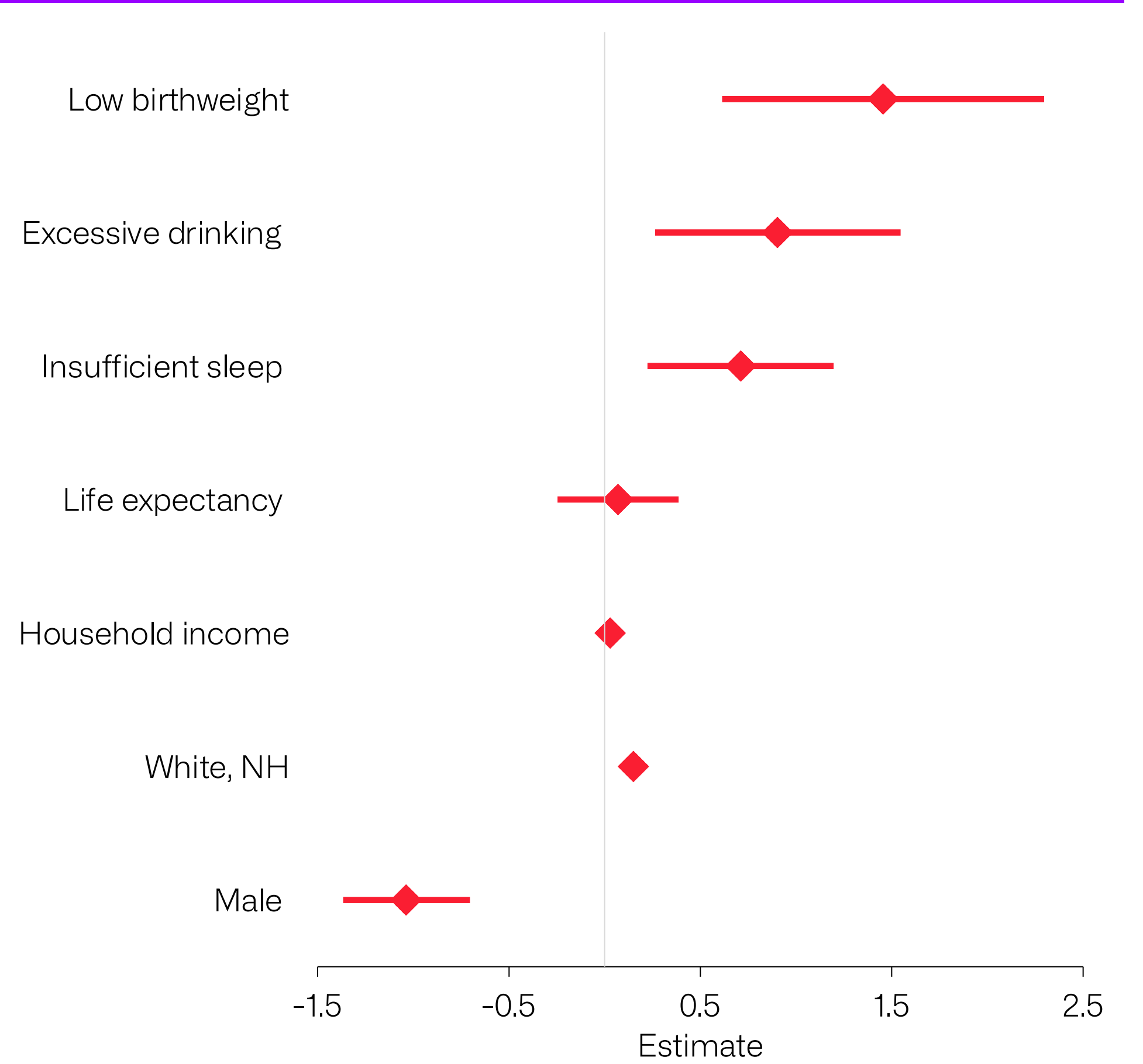### Figure 2. Impact of SDoH on Incident Cancer Model

Figure 3. Impact of SDoH on Prevalent Cancer Model

Limitations

- This study sample consisted of patients with commercial or private Medicare insurance; hence, the generalizability of the findings to other populations might be limited.
- Prevalence and incidence rates were derived from ICD-10 diagnosis codes found in the administrative claims record during the calendar year and thus may not capture conditions untreated within that year.
- The study is limited by potential unmeasured confounders that were not available for statistical control.
- The cross-sectional nature of study design prevents an assumption of causality between SDoH metrics and cancer incidence/prevalence rates.

Conclusions

- Findings from this study indicate that various environmental factors, including health behaviors and social factors may influence populations risk of cancer.
- Integrating social determinants into cancer research can shed light on systemic barriers to cancer care and inform public policies aimed at addressing the root causes of health disparities.
- Additional research to further understand the influence of SDoH on risk of serious diseases, like cancer, are warranted to help increase health equity.

References

1. Alcaraz KI, Wiedt TL, Daniels EC, Yabroff KR, Guerra CE, Wender RC. Understanding and addressing social determinants to advance cancer health equity in the United States: A blueprint for practice, research, and policy. CA Cancer J Clin. 2020 Jan;70(1):31-46.
2. Minas TZ, Kiely M, Ajao A, Ambs S. An overview of cancer health disparities: new approaches and insights and why they matter. Carcinogenesis. 2021 Feb 11;42(1):2-13.
3. Henley, S.J. et al. (2018) Rural cancer control: bridging the chasm in geographic health inequity. Cancer Epidemiol. Biomarkers Prev., 27, 1248–1251.
4. Alcaraz KI, Wiedt TL, Daniels EC, Yabroff KR, Guerra CE, Wender RC. Understanding and addressing social determinants to advance cancer health equity in the United States: A blueprint for practice, research, and policy. CA Cancer J Clin. 2020 Jan;70(1):31-46..
5. National Cancer Institute (NCI). Risk factors for cancer. Rockville, MD: NCI, 2016. Available from: http://www.cancer.gov/about-cancer/causes-prevention/risk

Disclosure

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