CANCER AND ENVIRONMENT FORUM

SESSION #2

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Effect of air pollution on mortality and morbidity among young cancer survivors

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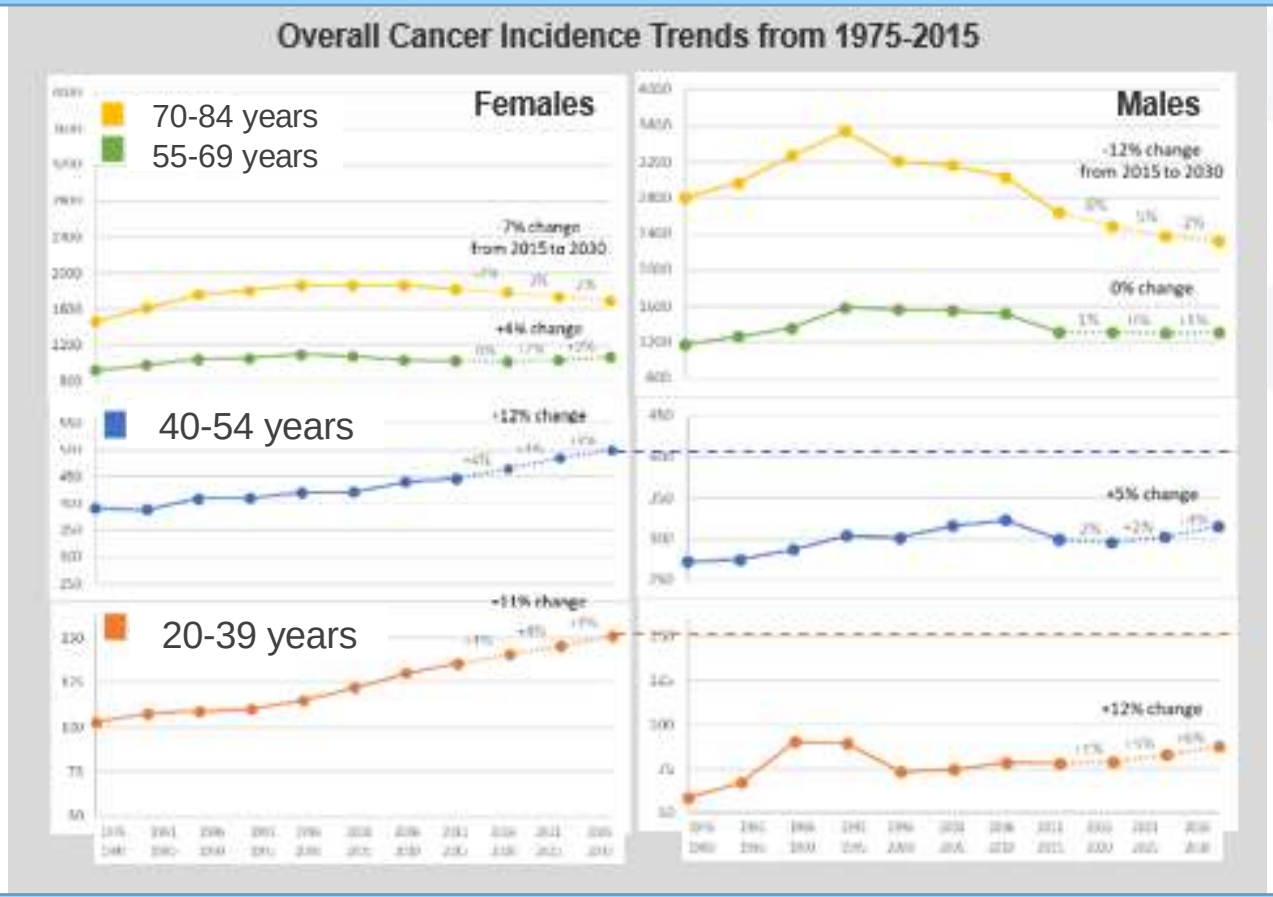
Disclosures

I have no relevant personal/professional/financial relationship(s) with respect to this presentation

Cancer incidence among children, adolescents, and young adults (AYA) has risen



After diagnosis, cancer survivors live in <u>the same environments that likely contributed to their cancer</u>

Kehm RD et al. 40 Years of Change in Age- and Stage-Specific Cancer Incidence

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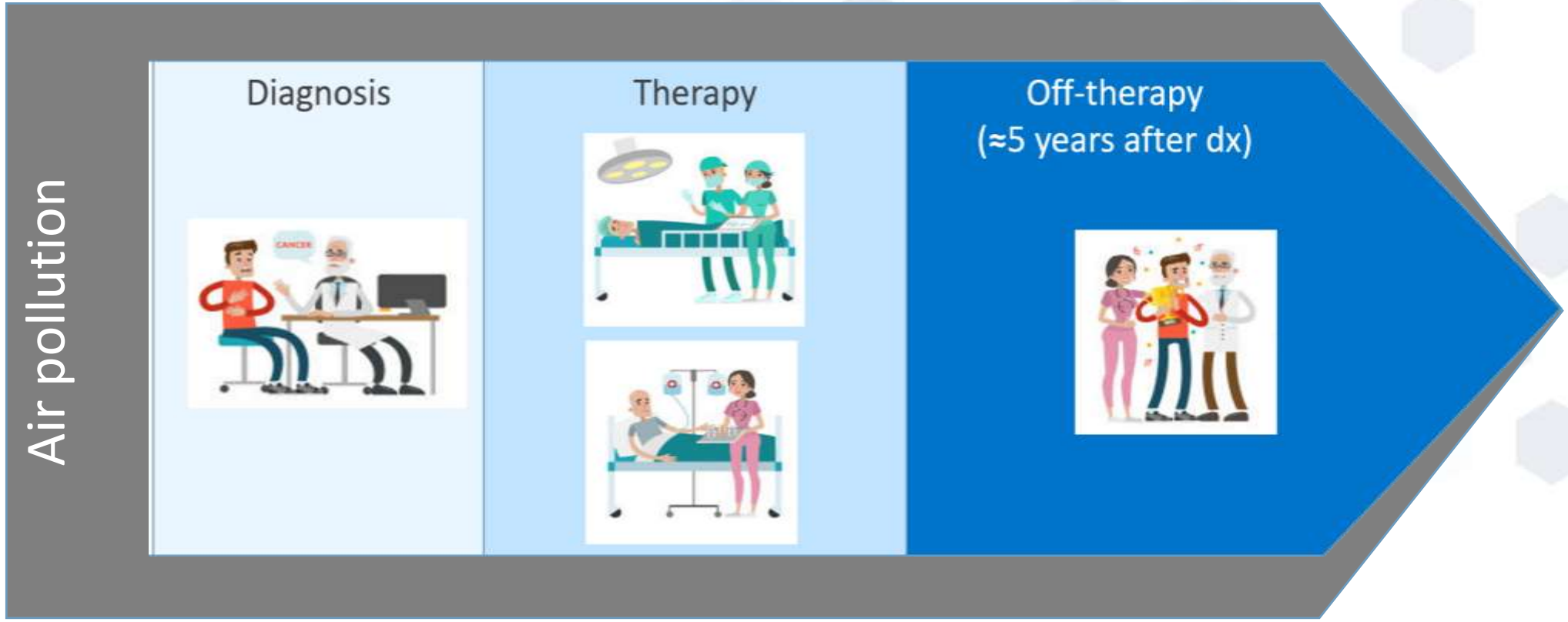
Diagnosis

Therapy

Off-therapy
(≈5 years after dx)

Exposure to air pollution after diagnosis may influence outcomes by:



- Continued carcinogenesis after diagnosis

Long-term $PM_{2.5}$ Exposure After Diagnosis And 5-Year Cancer Mortality Among Pediatric And AYA Survivors

$PM_{2.5}$ per 5 ug/m^3	HR	95% CI
Pediatric cohort (n=2,444; 0-14 years at dx)		
All cancer types	1.12	0.98-1.28
CNS neoplasms[1]	1.30*	1.08-1.56
Lymphomas	1.34*	1.06-1.68
AYA cohort (n=13,459; 15-39 years at dx)		
All cancer types	1.06	0.99-1.12
CNS neoplasms[1]	1.20*	1.06-1.36
Carcinomas	1.14*	1.06-1.22

[1]Central nervous system and intracranial/spinal neoplasms

*Significant at p <0.05 and 95% CI

^Marginally insignificant as indicated by 95% CI

Ou JY et al. Fine Particulate Matter Air Pollution and Mortality among Pediatric, Adolescent, and Young

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Long-term $PM_{2.5}$ Exposure After Diagnosis And 5-Cancer Mortality Among AYA Carcinoma Survivors

$PM_{2.5}$≥12 ug/m^3	HR	95% CI
Breast	1.50*	1.29–1.74
Colorectal	1.74*	1.29–2.35

[1]Central nervous system and intracranial/spinal neoplasms

*Significant at p <0.05 and 95% CI; ^Marginally insignificant as indicated by 95% CI

Italics indicate analyses for PM2.5 ≥ug/m3

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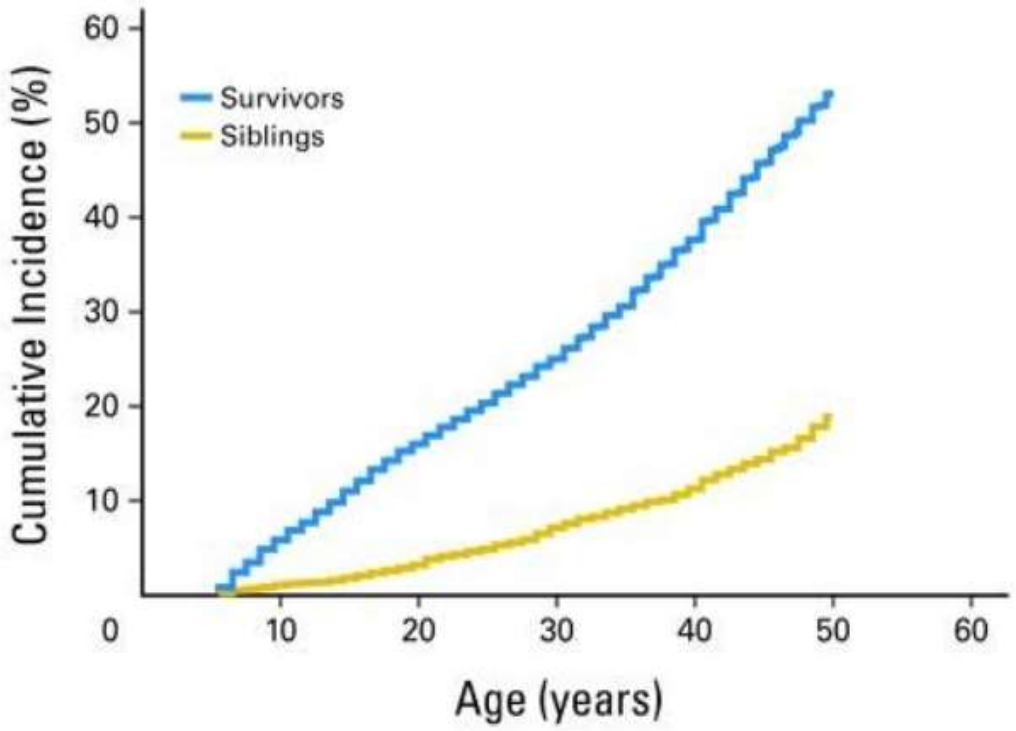
Late therapy effects are a major concern

60% to 90% of childhood cancer survivors develop one or more chronic health conditions in adulthood.

Leading non-cancer causes of death in childhood cancer survivors:

- Cardiovascular disease
- Infection
- Pulmonary disease

Cumulative incidence of grade 3 to 5 chronic health conditions among adult survivors of childhood cancers



Armstrong GT et al. Aging and Risk of Severe, Disabling, Life-Threatening, and Fatal Events in the Childhood

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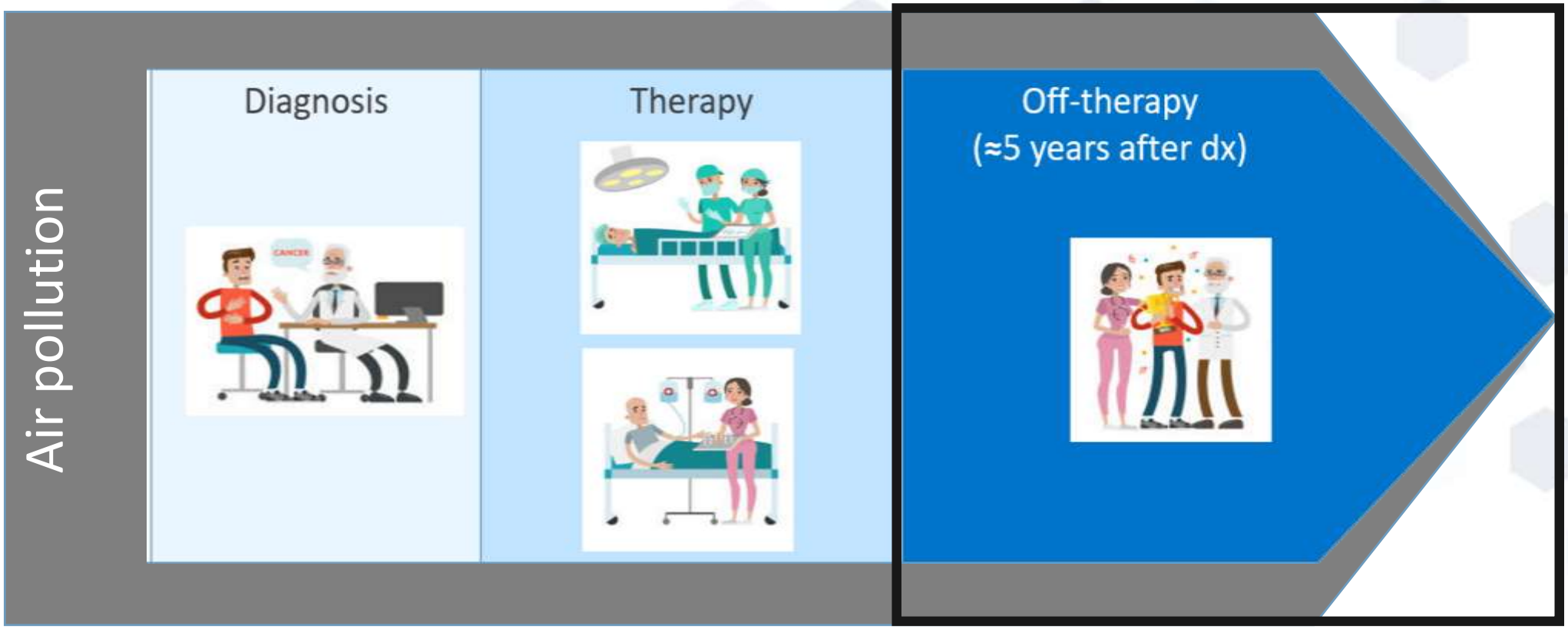
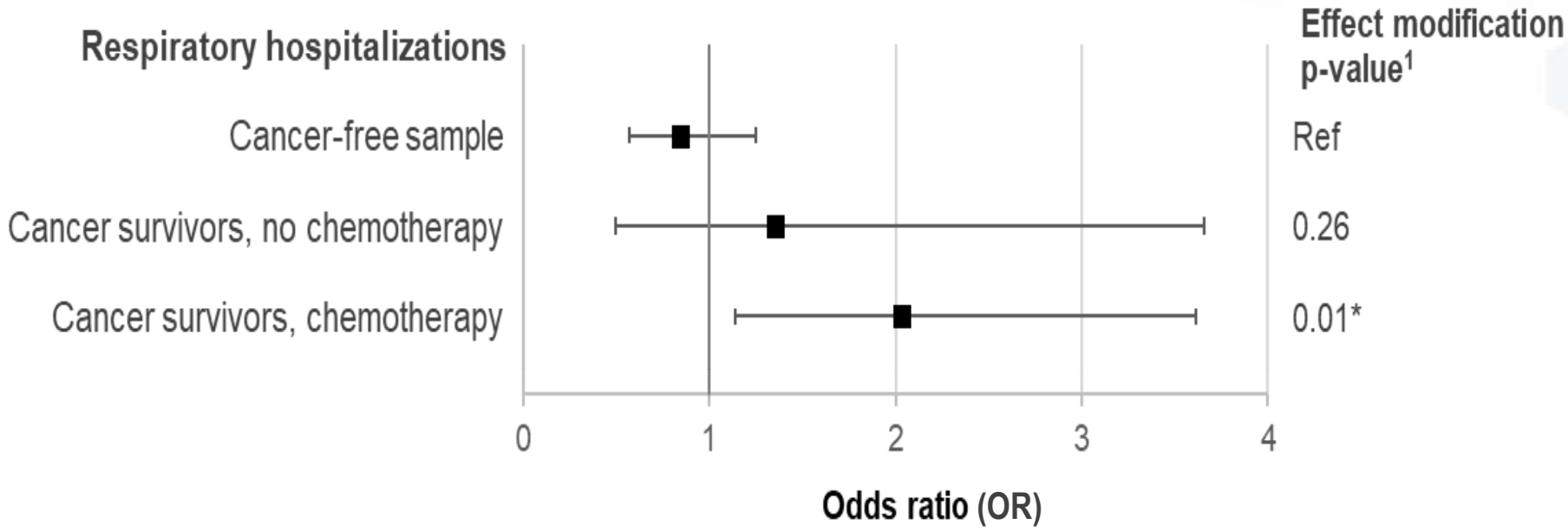
Exposure to air pollution while off-therapy may influence outcomes by:



- Therapy-related sensitization of the lung to air pollution
- Exacerbation of immunosuppression by air pollution

Short-term $PM_{2.5}$ Exposure and Respiratory Hospitalizations among Childhood Cancer Survivors and a Cancer-Free Sample



[1]p-value to test for effect modification of association of $PM_{2.5}$ on outcome by chemotherapy treatment; cancer-free sample is the reference group; *Significant at $p<0.05$

ORs among chemotherapy-treated survivors significantly greater than cancer-free sample

$PM_{2.5}$ and hospitalization for respiratory infection: $OR_{survivors}$=2.09 (95% CI=1.06–4.14)

Ou JY et al. Fine particulate matter and respiratory healthcare encounters among survivors of childhood

Particle Pollution and Your Patients' Health

This course is designed for family medicine physicians, internists, pediatri
practitioners, nurses, asthma educators, pulmonary specialists, cardiologi

Should I recommend that my patients reduce their exposure to particle pollution?

Yes. All people should be educated about the health effects from unhealthy levels of particle pollution and how to reduce exposure.

Patients more likely to be affected by particle pollution exposure that will benefit the most from exposure-reduction measures are:

- People with heart or lung diseases.
- People with diabetes.
- Older adults.

Health Link

Healthy living after treatment of childhood, adolescent, and young adult cancer

CHILDREN'S ONCOLOGY GROUP

The world's childhood cancer experts

Pulmonary Health after Cancer Treatment

What can I do to prevent lung problems?

- If you don't smoke, **DON'T START.**
- If you smoke, **QUIT!** Quitting is the most important thing you can do to keep your lungs and you healthy.
- Avoid second-hand smoke.
- Get regular physical exercise.
- Avoid inhaled drugs, such as marijuana.
- Avoid breathing toxic fumes from chemicals, solvents, and paints.
- Follow all safety rules in your workplace, such as the use of protective ventilators in some work environments. Report any unsafe working conditions to the Occupational Safety and Health Administration (OSHA).

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CA:
A Cancer Journal for Clinicians

Article | Free Access

American Cancer Society/American Society of Clinical Oncology Breast Cancer Survivorship Care Guideline

Cardiotoxicity

Recommendation 3.3: It is recommended that primary care clinicians (a) should monitor lipid levels and provide cardiovascular monitoring, as indicated (LOE = 0); and (b) should educate breast cancer survivors on healthy lifestyle modifications, potential cardiac risk factors, and when to report relevant symptoms (shortness of breath or fatigue) to their health care provider (LOE = I).

https://acsjournals.onlinelibrary.wiley.com/doi/full/10.3322/caac.21319

Opportunities for advancement and collaboration

1. Integrate recommendations for air pollution exposure reduction into survivorship guidelines

2. Acknowledge cancer survivors in public health messages about air pollution and cumulative risk assessment

3. Clinical interventions

Clinical Screening Tool for Air Pollution Risk
An affirmative answer to any question is associated with increased cardiovascular risk.

Household Air Pollution		
Does your household burn solid fuels (wood, coal, charcoal, dung, or agricultural residues) for cooking, heating, lighting or other purposes?	Yes	No
If "yes": *What type of fuel do you use?* *What type of stove do you use?* *How often do you burn solid fuel?* *How much time do you spend around the fire?* *Do you burn solid fuels inside the home?* *How do you ventilate smoke from your house?*		
Outdoor Air Pollution		
Do you live or work in an urban industrial center?	Yes	No
If "yes": *Are you aware of any sources of pollution near your home?* *Do you perform physical exertion outdoors?*		
Do you spend time near heavy traffic (e.g., multi-lane, high-speed roads)	Yes	No
If "yes": *Do you commute in traffic?* *Are you exposed to the open air when driving?* *Is your home located near major roads?*		

Hadley MB, Baumgartner J, Vedanthan R. Developing a clinical approach to air pollution

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4. Interdisciplinary research

Replication of studies on post-diagnosis air pollution and morbidity and mortality among survivors

- Turner MC et al.. Ambient air pollution and cancer mortality in the cancer prevention study II. Environmental health perspectives. 2017 Aug 21;125(8):087013.
- Coleman NC et al. Fine particulate matter air pollution and mortality risk among US cancer patients and survivors. JNCI cancer spectrum. 2021 Feb;5(1):pkab001.
- DuPré NC et al. Particulate matter and traffic-related exposures in relation to breast cancer survival. Cancer Epidemiology and Prevention Biomarkers. 2019 Apr 1;28(4):751-9.

Identify outcomes from therapy-air pollutant interactions

Examine the impact of pollutants on therapy efficacy

Identify provider and patients' perceptions of environmental health

Silence can be interpreted as no effect

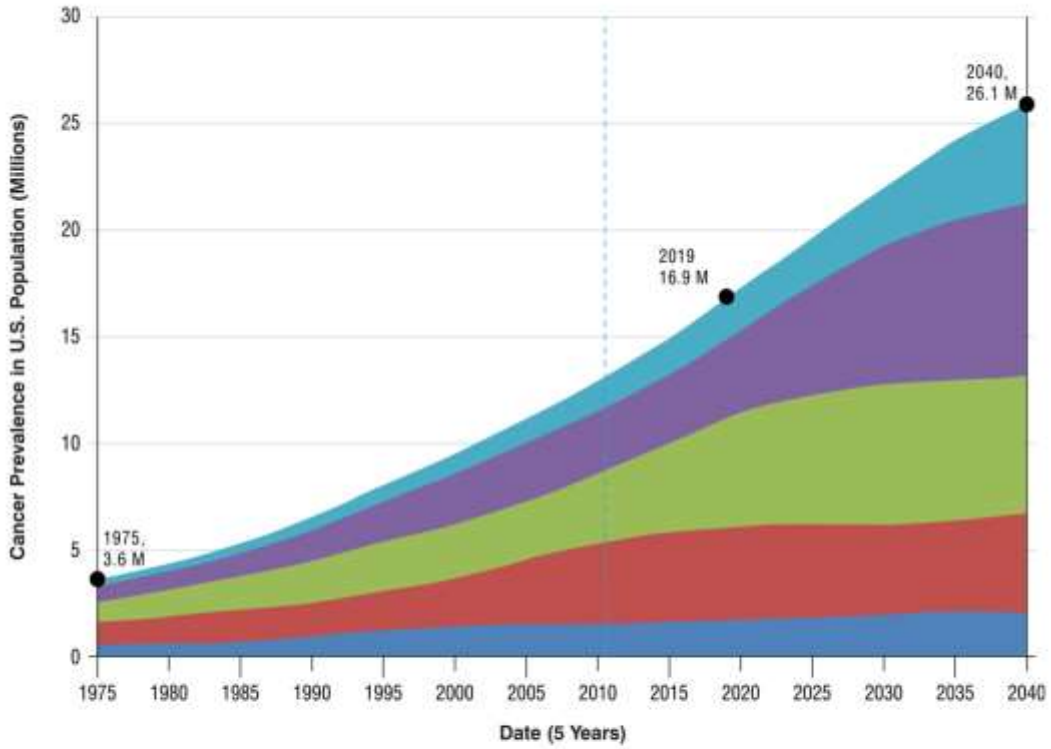
"I think [air pollution] can for sure, especially if [survivors] already had respiratory issues because of their treatment, it can be exacerbated by the air quality for sure."

"I don't [think there is a connection], I have never heard of anything of the kind."

Waters AR et al. Perceptions and knowledge of air pollution and its health effects among

The number of cancer survivors and exposure to air pollution are both expected to increase in the near future

Cancer Prevalence and Projections in U.S. Population from 1975–2040



REFERENCE: Bluethmann SM, Mariotto AB, Rowland, JH. Anticipating the "Silver Tsunami": Prevalence Trajectories and Comorbidity Burden

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Thank you