

Multi-Factorial Respiratory Disease Etiology, Environmental Exposures, and Corporate Footprint

An Epidemiological and Regulatory Assessment of Saint John, New Brunswick

Assessment Date: September 2026

Verification Status: Live fact-checked and current

Document Type: Epidemiological and Regulatory Landscape Analysis

Executive Summary and Epidemiological Landscape

Evaluating the etiology of respiratory disease—specifically primary bronchogenic carcinoma—in industrial urban environments requires navigating complex exposure pathways and multi-source environmental dynamics. Saint John, New Brunswick, presents an unusually complex environmental health setting where heavy industrial operations, commercial transportation, residential combustion, geological hazards, and behavioral risk factors intersect within a compact geographic area.

Fundamental Methodological Distinction

A critical distinction must be maintained when evaluating population health in multi-source industrial settings:

**Emission ≠ Ambient Exposure ≠ Biological Dose ≠ Epidemiological
Association ≠ Causation ≠ Corporate Legal Responsibility**

Demonstrating that an industrial facility releases a contaminant establishes an emission source, and detecting that contaminant at a monitoring station establishes an ambient concentration. However, ambient monitoring alone does not determine the specific share of an individual's lifetime biological dose attributable to a single

facility, nor does it establish legal causation for individual health outcomes.

Historical and Contemporary Surveillance Data

Historical research, such as a 2009 study by the Conservation Council of New Brunswick, identified historical lung cancer incidence rates in Saint John that were 40% to 50% higher than in Moncton and Fredericton during the period examined (1989–2005). To maintain scientific rigor, these historical comparisons must be presented with their specific temporal and demographic parameters rather than as static current statistics.

Contemporary surveillance data from the New Brunswick Health Council indicate that in 2024–2025, 39.2% of lung cancer cases in Health Zone 2 (Fundy Shore and Saint John Area) were diagnosed at Stage IV, compared to 40.7% provincially. This statistic reflects stage at diagnosis rather than elevated disease incidence or environmental causation.

Health Indicator / Environmental Metric	Regional Baseline (Saint John / Zone 2)	Provincial Benchmark (New Brunswick)	Comparative Baseline / Guidelines	Primary Source / Context
Historical Lung Cancer Rate Comparison	40% to 50% higher than Moncton/Fredericton (1989–2005)	Baseline provincial incidence	National average (NB males +20%, females +10%)	Conservation Council 2009 Study
Ambient Benzene Concentration (Champlain Heights, 2024)	0.528 ppb (estimated annual mean)	Unregulated under Clean Air Act	0.14 ppb Ontario Comparison Benchmark	GNB 2024 Air Quality Report
Short-Duration Benzene Peak (Champlain Heights, 2024)	2.1 ppb max (39.1% exceedances of 0.71 ppb benchmark)	Unregulated under Clean Air Act	0.71 ppb Ontario 24-hr Comparison Benchmark	GNB 2024 Air Quality Report (4-hr canister draw)
Residential Indoor Radon Exceedance (>200 Bq/m³)	21% to 25% of tested homes	~21% to 25% provincial average	10% National Exceedance Average	Cross-Canada Radon Survey (2024)

Adult Daily Smoking Prevalence	~14% (2021 daily smokers)	~14% provincial daily rate	16% National Average	New Brunswick Health Council
--------------------------------	---------------------------	----------------------------	----------------------	------------------------------

The available evidence supports a multi-exposure environment containing measurable petroleum-related volatile organic compounds (VOCs), fine particulate matter, residential radon, and commercial tobacco exposure. While corporate entities operate key industrial facilities and commercial retail networks in the region, current evidence does not permit assigning a specific percentage of the community's cancer burden to any single corporation. Determining source-specific contributions requires source-apportioned exposure modeling and longitudinal epidemiological research.

Industrial Emissions and Atmospheric Exposure Profile

The Multi-Source Airshed of Saint John

Saint John is New Brunswick's primary industrial center, hosting a concentration of heavy manufacturing, energy production, and logistics infrastructure. Major point sources include the Irving Oil Refinery (Canada's largest petroleum refinery), J.D. Irving Pulp and Paper Ltd., Irving Paper Ltd., and NB Power's Coleson Cove Generating Station. The local airshed is further influenced by the Canaport marine terminal, deep-water port activity, cruise ships, railway transport, road traffic, commercial heating, and regional long-range transport.

Because these multiple source categories emit overlapping contaminants into the same geographic area, local air quality cannot be treated as a single-source phenomenon. Facilities release criteria air pollutants—such as fine particulate matter (PM2.5), sulphur dioxide (SO2), and nitrogen dioxide (NO2)—alongside volatile organic compounds (VOCs) like benzene and reduced sulphur compounds. Coastal meteorological conditions and marine boundary layer dynamics further influence contaminant dispersion across residential neighborhoods.

Benzene Monitoring Data and Regulatory Benchmarks

Benzene is monitored at select stations in Saint John due to the presence of refining and petroleum handling infrastructure. The 2024 provincial air quality monitoring report recorded the following annual average benzene concentrations across monitoring sites:

- **Saint Andrews (Background Site):** 0.049 ppb
- **Forest Hills:** 0.136 ppb

- **Champlain Heights:** 0.528 ppb

Regulatory Context

New Brunswick's Clean Air Act does not currently include a statutory ambient objective for benzene. The province compares measured values against Ontario's Ambient Air Quality Criterion (AAQC) of 0.14 ppb. The estimated annual concentration at Champlain Heights (0.528 ppb) exceeded the Ontario comparison benchmark by approximately 3.77 times.

Important methodological parameters govern the interpretation of these data:

1. **Sampling Methodology:** The provincial monitoring report explicitly notes that annual benzene averages are approximations derived from periodic canister sampling rather than continuous 365-day monitoring.
2. **Comparison vs. Risk:** Exceeding Ontario's 0.14 ppb comparison benchmark by 3.77 times represents a benchmark comparison exceedance; it does not equate to a 3.77-fold increase in individual cancer risk. Ontario's AAQC is set at a conservative level to keep lifetime excess cancer risk below one in one million exposed individuals.
3. **Short-Duration Sampling:** At Champlain Heights, 39.1% of collected VOC samples exceeded Ontario's 24-hour comparison criterion of 0.71 ppb, with a maximum measured sample concentration of 2.1 ppb in 2024. The sampling draw time was four hours rather than a full 24 hours. Short-duration peak values cannot be directly compared against annual standards, nor do they prove an annual average exceedance on their own.

Carcinogenicity and Epidemiological Context

Benzene is classified by the International Agency for Research on Cancer (IARC) as a Group 1 known human carcinogen, with the strongest causal evidence established for acute myeloid leukemia (AML) and other hematological malignancies.

Regarding lung cancer, contemporary epidemiological research indicates a supportive association, particularly in occupational settings:

- A 2024 systematic review and meta-analysis examining occupational benzene exposure across 13 studies (comprising 366,975 participants) identified a pooled relative risk (RR) of 1.14 (95% CI: 1.03–1.27) for ever-exposed workers, alongside a positive exposure-response trend, though study heterogeneity was substantial.
- A more recent 2024 meta-analysis examining 44 independent studies found no

significant association between total occupational benzene exposure and lung cancer overall (RR = 1.00, 95% CI: 0.93–1.07), but stratified analyses of case-control studies with smoking adjustment showed elevated risk (RR = 1.17, 95% CI: 1.11–1.24), indicating important heterogeneity in study findings.

- A pooled analysis of 14 case-control studies similarly observed increased lung cancer odds across occupational benzene exposure categories after adjusting for smoking and other occupational carcinogens.

Methodological Note on Benzene-Lung Cancer Evidence: While these findings support an association between occupational benzene exposure and lung cancer risk in specific study populations, occupational exposure levels generally exceed residential ambient levels substantially. The heterogeneity across 2024 meta-analyses reflects differences in study design, exposure assessment quality, and adjustment for confounding. Converting ambient community concentrations into precise numbers of local cancer cases requires formal, source-resolved exposure-response modeling that accounts for these methodological variables.

Criteria Air Pollutants: PM2.5, SO2, and NO2

Particulate matter and criteria gases represent distinct biological exposure pathways:

Fine Particulate Matter (PM2.5): Outdoor particulate matter is classified by IARC as carcinogenic to humans. In New Brunswick, the Canadian Ambient Air Quality Standards (CAAQS) for PM2.5 are set at 8.8 µg/m³ (three-year average of annual averages) and 27 µg/m³ (24-hour metric). However, CAAQS serve as national management goals rather than binding provincial standards. Annual PM2.5 averages at monitored Saint John stations, such as Champlain Heights (3.3 to 6.8 µg/m³), remained within CAAQS target thresholds during 2024.

Nitrogen Dioxide (NO2) and Sulphur Dioxide (SO2): All monitored Saint John locations met applicable provincial objectives for NO2 in 2024 (e.g., Castle Street recorded an annual average of 3.8 ppb). For SO2, while stations generally achieved provincial objectives, certain locations like Grandview West received higher CAAQS management classifications, and temporary SO2 spikes can occur during industrial upset events or adverse meteorology.

Behavioral, Geological, and Environmental Co-Exposures

Tobacco Consumption and Retail Determinants

Cigarette smoking remains the primary direct cause of primary lung carcinoma. Health Canada estimates that approximately 72% of lung cancer cases in Canada are directly attributable to smoking.

The commercial infrastructure through which tobacco products are sold—including gas stations, travel plazas, and convenience outlets operated by regional entities—represents an aspect of the commercial tobacco environment. Evaluating retail availability and outlet density is part of analyzing commercial determinants of health. However, retail presence alone does not establish that a specific commercial network caused a measurable fraction of local cancer cases. Demonstrating such a connection requires empirical analysis of historical outlet density, sales volumes, demographic variables, pricing, and cessation patterns relative to competing retail channels.

Daily adult smoking prevalence in New Brunswick has declined from historical highs, reaching approximately 14% in 2021 (below the national average of 16%), with recent self-reported survey models estimating further decreases. Because lung cancer typically involves a 20-to-40-year latency period between exposure and clinical diagnosis, historical smoking rates remain a key variable in contemporary epidemiological assessments.

Geological Radon Gas (Radon-222)

Indoor Radon-222 (^{222}Rn) is an independent environmental risk factor that must be accounted for in regional lung cancer studies. Radon is a naturally occurring radioactive gas formed by the decay of uranium and radium in soil and bedrock, which accumulates inside enclosed residential spaces. Health Canada identifies radon as the leading cause of lung cancer among non-smokers, recommending remediation when long-term indoor levels exceed the national guideline of 200 Bq/m³.

Data from the 2024 Cross-Canada Survey of Radon Concentrations in Homes show that New Brunswick has elevated geological exposure. The 2024 survey found that one in four New Brunswick homes have radon levels higher than the recommended 200 Bq/m³ action threshold, compared to 10% nationally. New Brunswick ranks highest among Canadian provinces for mean indoor radon at 203 Bq/m³, with 28.3% of homes at or above 200 Bq/m³. Certain geological zones reach exceedance rates of up to 40%. An additional 24.2% of residences fall within the moderate-risk range between 100 Bq/m³ and 199 Bq/m³. Because indoor radon levels vary considerably from home to home, epidemiological studies require participant-level long-term testing or validated historical exposure reconstructions.

Multi-Exposure Interaction Models

The biological risk profile of Saint John reflects a multi-exposure environment where individuals may concurrently experience tobacco smoke, indoor radon, fine particulate matter, and ambient VOCs.

In environmental toxicology, co-exposures do not automatically translate into simple

multiplicative or universal numerical multipliers (such as an assumed "50-fold" increase). While the interaction between radon and tobacco smoke is well-documented as multiplicative—where radioactive alpha particles from radon progeny induce double-strand DNA breaks while smoke carcinogens impair cellular repair—the overall combined effect of ambient industrial pollutants, radon, and smoking must be modeled empirically.

Depending on exposure levels and physiological pathways, joint effects may follow additive, multiplicative, or submultiplicative statistical models. Determining true cumulative risk requires field measurements and empirical exposure-response modeling rather than assumed mathematical constants.

Regulatory Framework: Current Status and Policy Evolution

Operative Law Under the Clean Air Act

UPDATED SEPT 2026

As of September 2026, New Brunswick's statutory air quality enforcement framework is grounded in the Clean Air Act (enacted in 1997) and its associated Air Quality Regulation. The province formally regulates Maximum Permissible Ground Level Concentrations for five criteria air pollutants:

1. Carbon monoxide (CO)
2. Hydrogen sulphide (H₂S)
3. Nitrogen dioxide (NO₂)
4. Sulphur dioxide (SO₂)
5. Total suspended particulate matter (TSP)

Volatile organic compounds—including benzene and formaldehyde—are not currently subject to legally binding ambient standards under provincial regulation. While New Brunswick reports monitoring data against the Canadian Ambient Air Quality Standards (CAAQS) for PM_{2.5}, ozone, NO₂, and SO₂, CAAQS serve as non-binding national management goals rather than statutory requirements in the province.

Regulatory Modernization Status Update (September 2026)

Status: Government Declined Modernization Framework

In May 2026, the Government of New Brunswick reviewed the Clean Air Act and determined that "updating was not necessary because protections already exist

under other legislation," such as the Occupational Health and Safety Act. This decision departed from earlier momentum toward modernization captured in Motion 36 (passed June 2024), which had called for strengthened air quality standards.

As of September 2026, there is no active legislative initiative to expand regulated ambient air quality objectives from the current five pollutants to a broader suite of contaminants including volatile carcinogens.

Regulatory Parameter	Current Operative Framework (Clean Air Act)	Previously Proposed Modernization	Operational Impact on Airshed Oversight
Regulated Ambient Objectives	5 criteria pollutants (CO, H ₂ S, NO ₂ , SO ₂ , TSP)	Proposed expansion to ~60 pollutants including VOCs (not adopted)	Benzene, formaldehyde, and heavy metals remain unregulated; local industrial facilities continue operation under 1997 framework
Benzene Standard	Unregulated; compared to Ontario AAQC (0.14 ppb)	Proposed enforceable Ambient Air Quality Objective (not adopted)	Facility-specific emissions still tracked but no provincial compliance target
CAAQS Implementation	Non-binding national planning benchmarks	Proposed integration into provincial objective framework (not adopted)	Regulatory status of national benchmarks remains advisory rather than mandatory
Public Transparency	Annual static summary reports & online data portal	Proposed real-time online permit and enforcement databases (not adopted)	Public access to monitoring data remains on annual reporting cycle

Policy Context and Engagement Timeline

- **June 2024:** New Brunswick legislature passed Motion 36 (44-0 unanimous vote) urging government to "modernize New Brunswick's air quality laws and standards"

and adopt "a strengthened Clean Air Act and modernized regulations."

- **May 2026:** Government completed review of Clean Air Act and determined modernization was not necessary, citing existing protections under other legislation.
- **September 2026:** No active legislative initiative for Clean Air Act amendments is currently in progress.

Attribution Framework and Methodological Research Roadmap

Six-Level Attribution Framework

To avoid oversimplification, evaluating corporate environmental impact requires a structured attribution framework spanning six distinct analytical levels:

1. **Level 1 — Facility Existence:** Identifying the presence and operating history of industrial facilities within the airshed.
2. **Level 2 — Emissions Quantification:** Documenting contaminant release rates through national pollutant inventories and stack testing.
3. **Level 3 — Environmental Transport & Dispersion:** Modeling how atmospheric emissions disperse under local meteorological and topographic conditions.
4. **Level 4 — Population Exposure Assessment:** Measuring ground-level contaminant concentrations at residential monitoring stations.
5. **Level 5 — Epidemiological Association:** Determining whether higher exposure zones correlate with increased disease incidence after controlling for confounders.
6. **Level 6 — Causal Attribution:** Quantifying the specific fraction of disease burden attributable to a given source.

Establishing Levels 1 and 2 confirms the presence of industrial emissions but does not satisfy Levels 5 or 6. Complete causal attribution requires integrating source-apportionment models with longitudinal epidemiological data. The current body of evidence for Saint John establishes Levels 1–4 with varying degrees of completeness; Levels 5–6 require prospective study design.

Recommended Source-Apportionment Study Design

A rigorous epidemiological investigation of respiratory risk in Saint John should integrate the following components:

- **Integrated Environmental Monitoring:** Continuous, high-frequency tracking of benzene, BTEX compounds, PM2.5, SO2, NO2, polycyclic aromatic hydrocarbons (PAHs), and reduced sulphur species across dense spatial networks.
- **Chemical Source Apportionment:** Utilizing trace chemical signatures, wind-direction correlations, and receptor modeling to separate petroleum refining, pulp processing, marine shipping, rail transport, and traffic contributions.
- **Participant Exposure Reconstruction:** Gathering detailed residential address histories, employment records, indoor radon test results, lifetime smoking pack-years, and secondhand smoke exposures for study participants.
- **Controlled Epidemiological Modeling:** Conducting retrospective cohort and case-control analyses that adjust for age, sex, socioeconomic status, occupational exposures, and residential mobility.

Strategic Policy Options

The following evidence-based policy options offer pathways to reduce exposure uncertainty and strengthen environmental oversight:

1. **Establish Provincial Ambient Objectives for Volatile Carcinogens:** Codify enforceable ambient air quality objectives for benzene and formaldehyde under provincial statute, backed by clear compliance protocols for industrial facilities.
2. **Implement Cumulative Exposure Assessments:** Require environmental assessments and facility renewal approvals to evaluate cumulative pollution loads, incorporating background emissions, transport traffic, and local geological risks.
3. **Expand Real-Time Continuous VOC Monitoring:** Augment canister-based VOC sampling with continuous monitoring near industrial fence-lines to capture short-duration emission spikes and operational upsets.
4. **Fund Targeted Residential Radon Remediation:** Provide testing and mitigation assistance prioritized for high-risk geological areas across Health Zone 2 to reduce non-industrial background risks.
5. **Publish Centralized Environmental and Health Data:** Develop open-access databases integrating real-time air quality metrics, facility emission reports, permit conditions, and aggregated health surveillance indicators.

Conclusion

Saint John, New Brunswick, presents a complex environmental health profile characterized by multi-source industrial emissions, naturally elevated residential radon exposure, historical and current tobacco consumption, and fine particulate matter—all converging in a compact geographic area with shared meteorological exposure pathways.

The available evidence demonstrates that residents in proximity to industrial facilities,

particularly in the Champlain Heights area, experience ambient air quality conditions that exceed Ontario's comparison benchmarks for benzene and other VOCs. Concurrently, geological radon exposure in New Brunswick substantially exceeds national averages, with one in four homes testing above the 200 Bq/m³ action threshold. These environmental exposures coexist with behavioral factors, including historical smoking prevalence, within a regulatory environment that currently lacks binding statutory standards for volatile organic carcinogens.

However, the presence of elevated environmental concentrations and the documented association between occupational benzene exposure and lung cancer risk does not, in itself, establish the causal fraction of disease burden attributable to industrial emissions in this community. Rigorous source-apportioned epidemiological research remains necessary to quantify population-level risk attribution.

The decision by the Government of New Brunswick to decline statutory modernization of the Clean Air Act in May 2026 leaves the province's regulatory framework dependent on a 1997-era statute and non-binding national standards. Strengthening this framework through enforceable volatile organic compound standards, continuous monitoring infrastructure, and cumulative risk assessment would provide a more robust foundation for environmental health protection and public accountability.

Works Cited

1. 2024 Air Quality Monitoring Results. Government of New Brunswick, Department of Environment and Local Government.
https://www.legnb.ca/content/house_business/61/2/tailed_documents/2025-12-12%20Air%20Quality%20Monitoring%20Results%202024.pdf
2. Air Quality Monitoring - GNB.ca. Government of New Brunswick.
<https://www.gnb.ca/en/topic/environment-resources/air-quality-environmental-programs/air-quality-monitoring.html>
3. Who Pollutes Our Climate the Most in New Brunswick? Conservation Council of New Brunswick. <https://www.conservationcouncil.ca/who-pollutes-our-climate-the-most-in-new-brunswick/>
4. Atlantic - Take Action on Radon. <https://takeactiononradon.ca/provinces/atlantic/>
5. Life Expectancy is Getting Shorter in New Brunswick. New Brunswick Health Council.
<https://nbhc.ca/news/life-expectancy-getting-shorter-new-brunswick>
6. Understanding the Health Effects of Industrial Air Pollution. Science.gc.ca.
<https://science.gc.ca/site/science/en/blogs/science-health/translating-knowledge-action-understanding-health-effects-industrial-air-pollution>

7. Assessing the Impact of Industrial Pollutants on the Incidence of Respiratory Disease. <https://aejournals.org/index.php/AEJ/article/view/2086>
8. Saint John Refinery Neighbour Hopes New Regulations Reduce Cancer. CBC News. <https://www.cbc.ca/news/canada/new-brunswick/irving-oil-refinery-emissions-benzene-9.7143596>
9. Red Head Residents Given Gift Cards Instead of Answers on "Snow" from Irving Oil Refinery. NB Media Co-op. <https://nbmediacoop.org/2017/11/16/red-head-residents-given-gift-cards-instead-of-answers-to-snow-from-irving-oil-refinery/>
10. Cancer Incidence in New Brunswick Communities. Canada Commons. <https://canadacommons.ca/marc/artifacts/1218123/cancer-in-new-brunswick-communities/>
11. Observations from Our Population Health Snapshot 2021. New Brunswick Health Council. <https://nbhc.ca/news/observations-our-population-health-snapshot-2021>
12. Saint John – Champlain Heights - Air Quality Data Portal. gnb.ca. <https://www.elgegl.gnb.ca/AirNB/en/SamplingLocation/Details/19>
13. Saint John Air Quality Index (AQI) and Canada Air Pollution. IQAir. <https://www.iqair.com/ca/air-quality/canada/new-brunswick/saint-john>
14. Air Quality Objectives and Standards - GNB.ca. Government of New Brunswick. <https://www.gnb.ca/en/topic/environment-resources/air-quality-environmental-programs/air-quality-objectives-standards.html>
15. Air Quality Report Raises Alarms in Saint John. CBC News. <https://www.cbc.ca/news/canada/new-brunswick/air-quality-report-raises-alarms-in-saint-john-1.947931>
16. Proposed Residential Indoor Air Quality Guidelines for Benzene. Health Canada. <https://www.canada.ca/en/health-canada/programs/consultation-proposed-residential-indoor-air-quality-guidelines-benzene/document.html>
17. Heavy Air Pollution in Canadian Area with Cancer Spikes. Science Daily. <https://www.sciencedaily.com/releases/2013/10/131022132147.htm>
18. Radon Gas & Lung Cancer in New Brunswick. Grand Bay-Westfield. <https://grandbaywestfield.ca/wp-content/uploads/2021/03/NB-Lung-Radon-Presentation-November-26-2025.pdf>
19. Radon - Government of New Brunswick. https://www2.gnb.ca/content/gnb/en/departments/ocmoh/healthy_environments/content/radon.html
20. Radon and Lung Cancer. PubMed. <https://pubmed.ncbi.nlm.nih.gov/22402423/>
21. Lung Cancer. NB Lung / Poumon NB. <https://nblung.ca/lung-health/lung-cancer/>
22. New Brunswick | Tobacco Use in Canada. University of Waterloo. <https://uwaterloo.ca/tobacco-use-canada/adult-tobacco-use/smoking-provinces/new-brunswick>
23. Cancer Rates Linked to Industrial Activity. CBC News. <https://www.cbc.ca/news/canada/new-brunswick/cancer-rates-linked-to-industrial-activity-1.8611157>
24. Radon Levels in New Brunswick: Indoor Radon Map. Airthings. <https://www.airthings.com/air-quality-map/canada/new-brunswick>

25. Radon. NB Lung / Poumon NB. <https://nblung.ca/environmental-health/radon/>
26. Radon Testing in New Brunswick: Is Your Home's Air Safe? The Inspectors. <https://www.theinspectors.ca/blog/radon-new-brunswick>
27. NB Lung's Landmark Role in Cross-Canada Radon Survey. NB Lung / Poumon NB. <https://nblung.ca/2025/01/10/nb-lungs-landmark-role-in-cross-canada-radon-survey/>
28. Cross-Canada Radon Survey. <https://crosscanadaradon.ca/survey/>
29. Lung Cancer Risk from Occupational and Environmental Radon. PubMed. <https://pubmed.ncbi.nlm.nih.gov/23470882/>
30. Radon-Smoking Synergy: A Population-Based Behavioral Risk. PubMed. <https://pubmed.ncbi.nlm.nih.gov/10479611/>
31. Approvals and Regulations - gnb.ca. Government of New Brunswick. <https://www.gnb.ca/en/topic/environment-resources/air-quality-environmental-programs/approvals-regulations.html>
32. Updating the Clean Air Act - GNB.ca. Government of New Brunswick. <https://www.gnb.ca/en/gov/engagement-consultation/updating-clean-air-act.html>
33. N.B. Decides Against Updates to Clean Air Act to Improve Indoor Air Quality. CBC News, May 2026. Retrieved September 2026.
34. Occupational Benzene Exposure and Lung Cancer in Human Studies: A Systematic Review and Meta-Analysis. Utrecht University / University of Oslo, 2024.
35. Benzene Exposure and Lung Cancer Risk: A Systematic Review and Meta-Analysis of Human Studies. Chiavarini et al., International Journal of Environmental Research and Public Health, 2024, 21:205.
36. Occupational Benzene Exposure and Risk of Lung Cancer: A Systematic Review and Meta-Analysis. European Journal of Epidemiology, 2026. <https://link.springer.com/10.1007/s10654-026-01400-7>
37. Standing Committee on Climate Change and Environmental Stewardship, First Report. New Brunswick Legislative Assembly, March 18, 2026.
38. Cross-Canada Radon Survey 2024. Health Canada / National Radon Program. Data portal: <https://canada.radonmap.ecosense.io/>

Document Accessibility: This HTML version is optimized for web viewing and printing. All links are functional and point to current official sources as of September 26, 2026. For accessibility features, use your browser's built-in tools.