Forest-Fire Intensity, and Age-Standardized Heart-Attack Hospitalization Rates in Canada, 2014–2022: An Ecological Observational Time-Series Study

Intensité des feux de forêt et taux d'hospitalisation standardisée par âge des crises cardiaques au Canada, 2014–2022 : une étude écologique observationnelle en série temporelle

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Abstract | Résumé

Wildfires have become more prevalent and intense with climate change. The inhalation of wildfire smoke is known to increase systemic inflammation and oxidative stress, increasing rates of respiratory disease and potentially some cardiovascular diseases. while some studies link exposure to particulate matter of size 2.5 microns ($PM_{2.5}$) with respiratory and cardiovascular outcomes, the effect on heart-attack hospitalizations, particularly at the national scale in Canada, remains unclear. This ecological observational time-series study used 108 province-year observations between 2014 and 2022 from the CIHI (Canadian Institute for Health Information) age-standardized heart-attack hospitalization rates database and the National Forestry Database for all 10 Canadian provinces and three territories. The outcome variable was age-standardized heart-attack hospitalization rates per 100,000, and the main exposure was a wildfire exposure index aggregating wildfire intensity metrics into a single variable. Using multiple linear regression with province-fixed effects adjusting for year ($\alpha = 0.05$). Wildfire exposure was not significantly associated with heart-attack hospitalization rates ($B = -0.0017$, $p = 0.338$). The year showed significant negative association with heart-attack hospitalization rates ($B = -5.25$ per 100,000 per year, $p < 0.001$). The model explained a large proportion of the variance in heart-attack hospitalization rates (adjusted $R^2 = 0.82$). At the province-year scale, wildfire intensity does not appear to be a major driver of annual heart-attack hospitalization rates. Variation in heart-attack rates is more driven by provincial differences and secular declines over time. More individual-level studies using high-resolution wildfire-smoke exposure data are required to clarify potential cardiovascular impacts, especially at the short-term scale.

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Les incendies de forêt sont devenus plus fréquents et intenses avec le changement climatique. L'inhalation de fumée des feux de forêt est connue pour augmenter l'inflammation systémique et le stress oxydatif, augmentant les taux de maladies respiratoires et potentiellement certaines maladies cardiovasculaires. Bien que certaines études associent l'exposition aux particules d'une taille de 2,5 microns (PM2,5) aux résultats respiratoires et cardiovasculaires, l'effet sur les hospitalisations pour crise cardiaque, en particulier à l'échelle nationale au Canada, reste incertain. Cette étude écologique observationnelle en série temporelle a utilisé 108 observations provinciales-années entre 2014 et 2022 issues de la base de données standardisée des taux d'hospitalisation des crises cardiaques de l'Institut canadien de la santé (CIHI) et de la base de données nationale des forêts pour les 10 provinces canadiennes et trois territoires. La variable de résultat était les taux d'hospitalisation standardisés par âge pour 100 000 habitants, et l'exposition principale était un indice d'exposition aux feux de forêt regroupant les métriques d'intensité des feux en une seule variable. En utilisant une régression linéaire multiple avec des effets fixés par province ajustant pour l'année ($\alpha = 0,05$). L'exposition aux feux de forêt n'était pas significativement associée aux taux d'hospitalisation pour crise cardiaque ($B = -0,0017$, $p = 0,338$). L'année a montré une association négative significative avec les taux d'hospitalisation par crise cardiaque ($B = -5,25$ pour 100 000 par an, $p < 0,001$). Le modèle expliquait une grande partie de la variance des taux d'hospitalisation pour crise cardiaque ($R2$ ajusté = 0,82). À l'échelle provinciale et annuelle, l'intensité des feux de forêt ne semble pas être un facteur majeur des taux annuels d'hospitalisation par crise cardiaque. La variation des taux d'infarctus est davantage due aux différences provinciales et à une réduction séculaire. Davantage d'études individuelles utilisant des données d'exposition à haute résolution à la fumée d'incendie de forêt sont nécessaires pour clarifier les impacts cardiovasculaires potentiels, en particulier à court terme.

Keywords: Wildfire; Myocardial Infarction; Ecological Study; Canada

Introduction

There is no doubt that climate change has many deleterious effects on the environment which have been detracting from quality of life over the last century. The global surface temperature has been increasing rapidly, with rates tripling over the last 40 years (1). Simultaneously, rates of wildfires have been steadily rising for centuries, with rates in 2023/2024 doubling those from 2000–2022 (2). Canada has seen a dramatic increase in the frequency of wildfires in recent years. By the end of 2023, Canada saw record-breaking numbers with more than 6,000 fires and over 2.5 million hectares burned (3). A study conducted by the World Weather Attribution found that the likelihood of wildfires in Quebec was at least doubled as a direct result of climate change (4). Climate change has increased the frequency of wildfires through multiple mechanisms: higher temperatures lead to low humidity, drier plants, and higher winds to spread the fire. Additionally, climate-driven atmospheric circulation shifts have prolonged fire seasons, while also altering large-scale weather patterns, trapping some regions under heat waves. Independent of climate change, fuel accumulation plays a lesser role. Areas which have suppressed natural fires for decades, especially urban regions of Canada, have allowed dense and crowded forests to grow, increasing their risk of ignition and propagation (5).

As wildfire activity increases, public health concerns are not limited to the immediate danger of burns, evacuations, and property loss; wildfires also generate smoke that can travel long distances and expose large populations to fine particulate matter. Wildfires are linked to several pathologies due to the release of particulate matter with size of particle 2.5 microns ($PM_{2.5}$). In Canada about 16% of $PM_{2.5}$ comes from wildfire smoke, which is linked to increased mortality, especially from respiratory and cardiovascular diseases (6). $PM_{2.5}$ also spreads rapidly over long distances far from the source, posing a risk to surrounding communities (6). $PM_{2.5}$ raises mortality by triggering systemic inflammation and oxidative stress. (Pei et. al. (7)) demonstrated that in ApoE-deficient mice (a model prone to heart disease), oxidative stress in the form of reactive oxygen species and lipid peroxidation, as well as systemic inflammation, inflammatory cytokines were elevated in response to real ambient $PM_{2.5}$ exposure. These processes damage blood vessels and promote atherosclerosis, increasing the risk of acute and chronic cardiovascular pathologies, including heart-attack, stroke, arrhythmias, and heart failure (8). The theoretical link between wildfires and cardiovascular pathologies in humans raises concerns considering the acceleration of climate change and the pervasive nature of air pollution.

Several earlier studies have examined the link between wildfire-smoke and cardiovascular events. (Delfino et. al. (9)) conducted a time-series/panel analysis which focused on the effect of wildfire-related $PM_{2.5}$ exposure on daily hospital admissions for cardiovascular and respiratory disease in seven million Southern California residents during the 2003 Southern California wildfires. They found a strong increase in various types of respiratory admissions, but weak evidence supporting an effect on cardiovascular incidents. (Johnston et. al. (10)) explored the effects of bushfire-related particulate matter with size of particle 10 microns (PM_{10}) emissions on respiratory and cardiovascular mortality in Sydney, Australia. They ran a 13-year time-series study on roughly four million residents from 1994–2007 and again found strong evidence linking the air pollutant to respiratory mortality, but no consistent association for cardiovascular-related mortality. Since PM_{10} is known to pose fewer health risks than $PM_{2.5}$, it is largely unsurprising that the cardiovascular findings were consistent with that of (9).

While time-series/panel analysis studies are useful epidemiological study designs, they are limited in their ability to identify weak associations due to their lack of control for between-person confounders. (Haikerwal et. al. (11)) was the first group to conduct a case-crossover study in examining the link between wildfire $PM_{2.5}$ and acute cardiac pathologies. The study examined all adult OHCA (Out-of-Hospital Cardiac Arrest) and ischemic events reported in Victoria, Australia from December 2006 to January 2007. The case-crossover design allows for individuals to serve as their own control, comparing their exposure to $PM_{2.5}$ around the day they had a heart-attack to exposure the weeks to months before they had it. This improvement in study design allowed them to identify a statistically significant increase in cardiac arrest and ischemic heart disease on high-smoke days, one of the first pieces of evidence that wildfire smoke may be a factor in triggering acute cardiac events. However, this effect was only found in a narrow time window during one fire season, which may restrict the generalizability of their findings to other regions or less severe fire seasons.

(Liu et. al. (12)) conducted a large multi-state cohort with exposure modelling on over five million Medicare enrollees (65+) from 2004–2009. They compared wildfire-specific $PM_{2.5}$ exposure to hospital admissions for cardiovascular and respiratory disease. They found no significant evidence of wildfire exposure affecting cardiovascular admissions, further obscuring the effects of wildfire exposure on cardiovascular pathologies.

(Hao et. al. (13)) followed about 22 million Americans (65+) from 2007–2018 using detailed air-pollution models to differentiate wildfire smoke from other ambient sources of $PM_{2.5}$. Using a long-term cohort analysis, they analyzed who developed heart failure subsequently. Uniquely, this study measures the long-term effects of wildfire exposure on heart failure, rather than short-term effects during the days and weeks of a fire. They found a 1.4% increase in risk of heart failure for every extra 1 $\mu g/m^3$ of average wildfire $PM_{2.5}$ exposure over the two-year period. This is among the strongest evidence linking wildfire exposure to an increased risk of heart failure, making the positive association between wildfire exposure and heart-attack rates seem more probable, but the effect is still unknown.

Most studies show clear respiratory effects from wildfire smoke but the effects on myocardial infarction are mixed. The focus tends to be on short-term effects of wildfire smoke on overall

cardiovascular disease, but there is no Canada-wide, multi-year analysis explicitly linking provincial fire activity to age-standardized heart-attack hospitalization rates. Therefore, this study seeks to quantify the association between wildfire intensity and age-standardized heart-attack hospitalization rates across Canadian provinces/territories from 2014–2022. This study hypothesizes that higher wildfire activity is associated with an increase in heart-attack hospitalization rates, even after adjusting for year and province.

Methods

This study used an observational ecological panel design, with 108 province-year observations from 2014–2022 in Canada. The sample population represents all Canadian provinces and territories. This analysis used de-identified, aggregate, and publicly available data and thus did not require individual consent or research ethics board approval.

This analysis compared the rates of heart-attack hospitalization and intensity of Canadian wildfires using the hospitalized heart-attack dataset from the CIHI (14) and the National Forestry Database from the Council of Canadian Forest Ministers (15). The datasets overlapped between 2014 and 2022; data in these years were used in the analysis. The sample size was 108 province-year observations for each fire class size.

Outcome

The outcome variable is age-standardized heart-attack hospitalization rate per 100,000 Canadians (continuous). Rates were already age standardized by CIHI to the 2011 standard population. This variable includes all patients age 18 or older who were admitted to an acute care hospital. It only measures events which are either the first ever hospitalization for acute myocardial infarction (AMI), or that happen more than 28 days after the admission date for the previous AMI admission. Therefore, the outcome captures hospitalized AMI events but does not include any out-of-hospital cardiac arrests, fatal myocardial infarctions occurring before hospitalization, nonhospitalized ischemic events, unstable angina, or arrhythmias.

Exposure

Wildfire intensity (continuous) was measured using the annual counts for each fire class size per province in the National Forestry Database. These size categories were grouped by hectare (ha) range (10,000 m²). These ranges were: up to 0.1 ha; 0.11–10 ha; 10.1–100 ha; 100.1–1 000 ha; 1 000.1–10 000 ha; 10 000.1–100 000 ha, and over 100 000 ha. Since larger fires have the capacity to produce more harm, an exposure index combines all individual size categories into a single level statistic, weighing the smallest category by , the second smallest by , the third smallest by , etc. The combination of these ranges into one statistic reduces multicollinearity, while maintaining the relative fire-size effects on human health. The weights were chosen as a heuristic ordinal scoring approach to preserve the increasing severity of larger fire-size categories while avoiding the inclusion of multiple highly correlated fire-size variables in the regression model. These weights were not intended to estimate actual emissions, burned area, or $PM_{2.5}$ concentrations. Because the weighting scheme is arbitrary, the exposure index should be interpreted only as a relative indicator of annual wildfire activity, not as a validated measure of smoke exposure.

This index functions as an ecological proxy rather than a direct measure of population-level smoke exposure. The index is based on fire size, frequency, and does not incorporate population density, smoke dispersion, exposure duration, or any direct measure of $PM_{2.5}$. It is assumed larger fires have a greater potential to generate harmful smoke, but it should not be interpreted as equivalent to population-level $PM_{2.5}$ exposure.

Covariates

Year (continuous) accounted for national temporal trends, while province (categorical) was used to account for unmeasured province-level differences such as geography, demographics, healthcare access, structural differences, and chronic disease burden, which typically do not vary meaningfully over time. Alberta was used as the reference category.

Statistical *analysis*

Descriptive statistics were used to summarize the two primary study variables: age-standardized heart-attack hospitalization rates and exposure index. The means, standard deviations and ranges were used to characterize the overall variability across provinces and years. These results are presented in Table 1. Two figures were used to visualize province-fixed effects, yearly trends, and outliers. A third figure was used to visualize the adjusted prediction plot of the linear model, with 95% CI.

The main analysis used multiple linear regression with province fixed effects to estimate the association between heart-attack hospitalization rates, and exposure index. These results are shown in Table 2. Model assumption checks indicated no multicollinearity concerns (VIF < 1.5). A Q-Q plot was used to assess normality of residuals, which found approximate normality with slight deviation in the upper tail. Statistical significance was defined as $\alpha = 0.05$ (two-sided). All analyses were performed using jamovi version 2.3 (16).

Results

Across the 108 province-year observations, the mean heart-attack hospitalization rate across provinces between 2014–2022 was 322.70 per 100,000 (SD = 61.65), with rates ranging between 212.82–479.95. The average exposure index was 1,942.30 (SD = 2,095.50), with a range between 0.00–10,387.00, reflecting high variation in yearly wildfire activity from province to province (Table 1).

Figure 1 shows that there is substantial variability in heart-attack hospitalization rates across provinces and territories. British Columbia, Saskatchewan, and Alberta had the lowest rates, while Quebec, Newfoundland and Labrador, and New Brunswick had the

Table 1. Descriptive statistics for age-standardized heart-attack hospitalization rates, and wildfire-intensity categories across 108 province-year observations, Canada (2014–2022). Statistics are based on 108 province–year observations. Heart-attack hospitalization rates are age-standardized per 100,000 population; the exposure index reflects annual wildfire intensity

Statistic	Age-Standardized Heart-Attack Rate per 100,000	Exposure Index
N	108	108
Mean	322.70	1942.30
Standard Deviation	61.65	2095.50
Minimum	212.82	0
Maximum	479.95	10387

highest. Many provinces had large interquartile ranges, and scattered outlier values, reflecting high year-to-year variability.

Rates of heart-attack hospitalization generally declined between 2014, and 2022. The interquartile ranges for each year had some area of overlap with other years, reflecting province-level differences. Quebec in 2019 was marked as an outlier for its significantly higher rate of heart-attack hospitalizations in that year compared to other provinces/territories (Figure 2).

The regression model explains approximately 83% of the variance in heart-attack hospitalization rates. The overall F test ($F(13, 94) = 34.878$, $p < 0.001$) was significant, indicating that the predictors collectively accounted for substantial variation (Table 2). The year fit showed that national rates of heart-attack hospitalization significantly decreased over time ($p < 0.001$), with each calendar year associated with five fewer hospitalizations per 100,000, controlling for fires, and province differences.

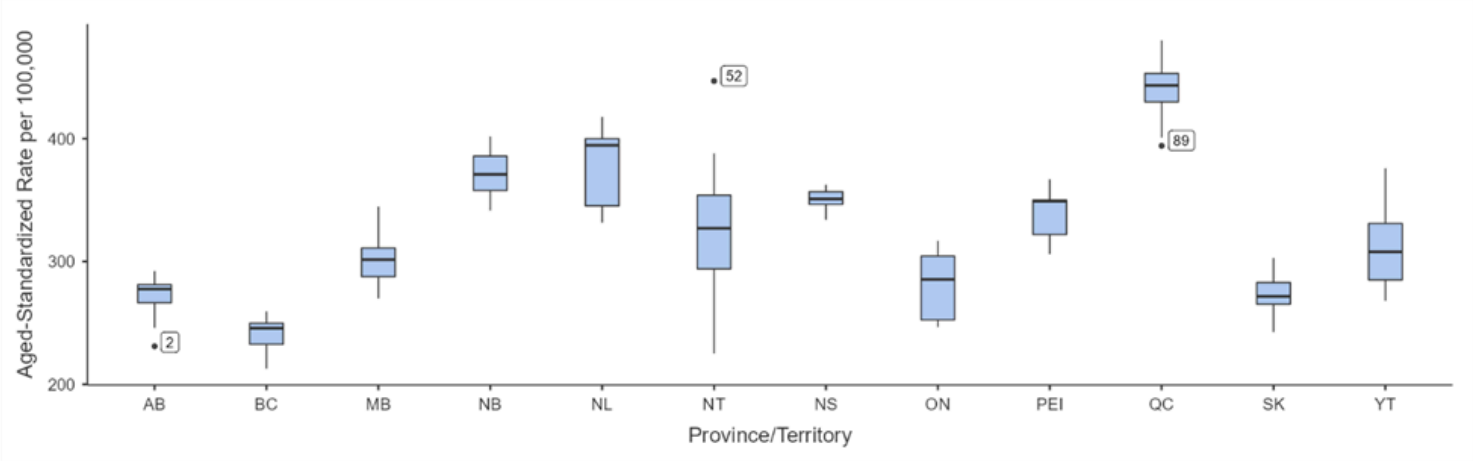

Figure 1. Distribution of age-standardized heart-attack hospitalization rates by province/territory, Canada, 2014-2022. Boxplots show the median, interquartile range, and range of values by province/territory; points indicate outliers.

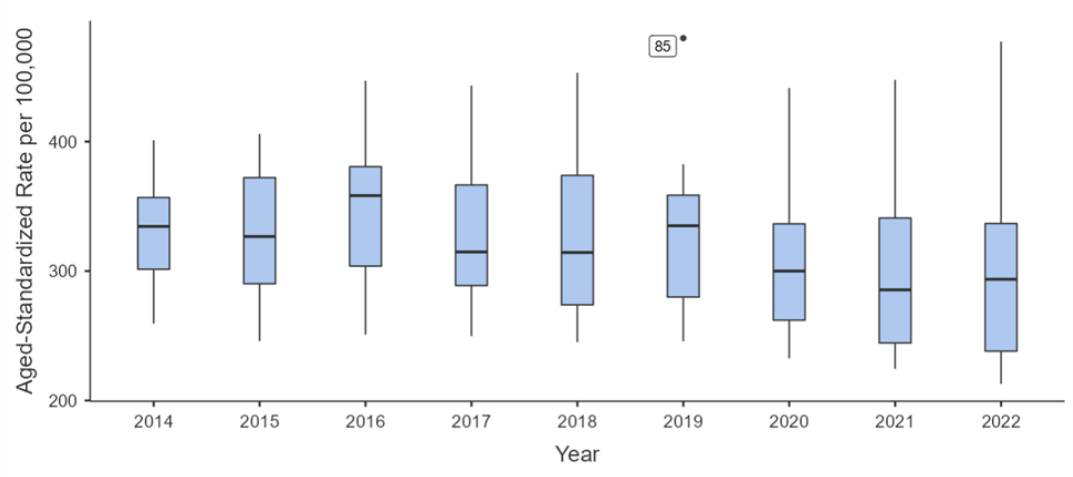

Figure 2. Distribution of age-standardized heart-attack hospitalization rates by year across Canadian provinces/territories (2014-2022). Boxplots show the median, interquartile range, and range of age-standardized rates per 100,000 by year; points indicate outliers.

Table 2. Multiple linear regression predicting age-standardized heart-attack rates from wildfire exposure index, province/territory, and year (Canada, 2014-2022). Coefficients represent the change in the age-standardized heart-attack rate (per 100 000 population) associated with a one-unit increase in each predictor, controlling for all other variables. The reference category for Province is Alberta.

Predictor	Estimate (B)	SE	t	p
Intercept	10874.42	2062.17	5.27	< .001
Year	−5.25	1.02	−5.14	< .001
Exposure Index	−0.00174	0.00181	−0.96	.338
Province/Territory (Ref: Alberta)				
British Columbia	−21.38	13.11	−1.63	.106
Manitoba	37.93	12.73	2.98	.004
New Brunswick	99.70	14.34	6.95	< .001
Newfoundland & Labrador	107.81	14.14	7.62	< .001
Northwest Territories	60.26	12.87	4.68	< .001
Nova Scotia	81.06	14.01	5.79	< .001
Ontario	15.92	12.93	1.23	.221
Prince Edward Island	68.54	14.30	4.79	< .001
Quebec	172.56	13.42	12.86	< .001
Saskatchewan	6.81	12.86	0.53	.598
Yukon	42.39	13.53	3.13	.002

The exposure index was insignificant, showing no association between yearly wildfire incidence, and rate of hospitalized heart-attacks.

To show provincial fixed effects, Alberta was used as the reference. British Columbia, Ontario, and Saskatchewan had no significant difference in their adjusted rate of heart-attack hospitalizations, while every other province had significantly higher rates ($p < 0.05$). These fixed effects indicate that there remains substantial between-province/territory variation after adjusting for year, and exposure.

Model assumption checks indicated no major multicollinearity concerns. VIF values were low for year (VIF = 1.0058), exposure index (VIF = 1.4379), and province/territory (VIF = 1.0337).

Figure 3 represents the adjusted relationship between wildfire exposure index, and age-standardized heart-attack hospitalization rates. After controlling for year, and province fixed effects, the association was weak. Lower exposure seemed to have a slightly negative association, while confidence intervals widened substantially with increasing exposure, indicating considerable uncertainty in the adjusted association at higher exposure values.

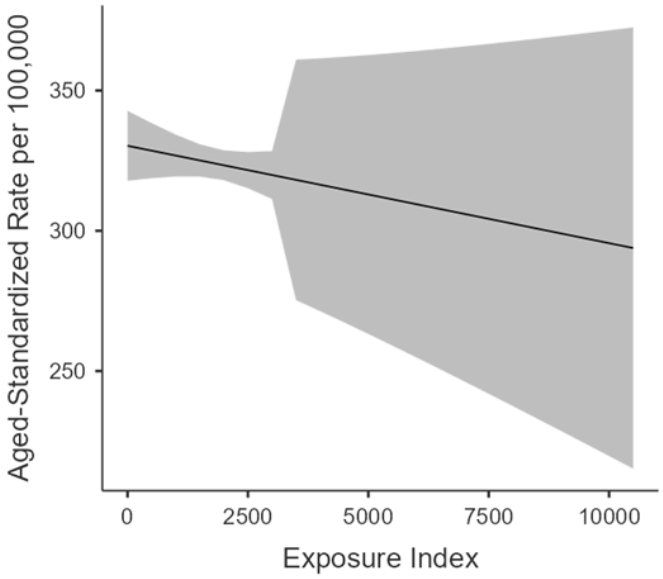

Figure 3. Adjusted association between wildfire exposure index, and age-standardized heart-attack hospitalization rates (Canada, 2014-2022). Predictions adjusted for year (continuous), and province (fixed effects). The shaded region represents the model-based 95% confidence interval.

Discussion

This ecological panel study examined whether annual variation in wildfire intensity was associated with age-standardized heart-attack hospitalization rates across Canadian provinces and territories from 2014–2022. In a multiple linear regression model with province fixed effects, and adjustment for year, there was no significant association between wildfire exposure index, and heart-attack hospitalization (B = -0.0017, p =.338). The year showed significant negative association with heart-attack hospitalization rates (B = -5.25 per 100,000 per year, p < 0.001). This model explained a large proportion of the variance in heart-attack hospitalization rates (adjusted R^2 = 0.82), suggesting most of the difference was accounted for by province-level differences, and a stable decline over time, rather than wildfire activity. The large province/territory fixed effects likely reflect persistent regional differences in cardiovascular risk, healthcare access, coding or hospitalization practices, socioeconomic conditions, comorbidity burden, and demographic structure not fully captured by age standardization. For example, Quebec, Newfoundland and Labrador, New Brunswick, and Nova Scotia had substantially higher adjusted rates than Alberta, suggesting that stable regional factors explained more variation in annual heart-attack hospitalization rates than wildfire activity. Consistent with national cardiovascular trends, we observed a significant decrease in heart-attack hospitalization rates from 2014–2022, even after accounting for wildfires and province differences. This reflects the consistent year-to-year improvements in cardiovascular prevention, and treatment (17). These findings suggest that if heart-attack risk is affected by wildfire exposure, it is small relative to the other determinants or not well captured by the aggregate exposure metric.

Figure 3 shows a weak negative adjusted slope between wildfire exposure index, and age-standardized heart-attack hospitalization rates; however, this pattern should not be interpreted as evidence of a protective effect. The confidence intervals widen substantially at higher exposure values, indicating sparse data, and greater uncertainty at the upper end of the wildfire exposure distribution. Therefore, the model is least precise for the highest wildfire-intensity province-years, limiting interpretation of the association in extreme fire years.

Our null association for heart-attack hospitalization is broadly consistent with systematic reviews showing that wildfire exposure has clear respiratory effects but less evidence that it affects cardiovascular morbidity, and myocardial infarction rates. The Annual Review of Medicine reported there is a clear effect on respiratory hospitalization but less consistent evidence on cardiovascular morbidity (18). Earlier short-term time series studies during the major wildfire episodes in Southern California, and Sydney (9, 10) reported strong associations between respiratory admissions, but null or weak evidence supporting associations of cardiovascular admissions, slikethe absence of a clear myocardial infarction signal in our study.

Newer research has identified a short-term increase in acute cardiac arrests on high-smoke days, suggesting that wildfire smoke may trigger an effect in susceptible individuals. In Victoria, Australia, (Haikerwal et. al. (11)) found that short-term increases in $PM_{2.5}$ exposure was associated with an increase in cardiac arrest, and ischemic heart disease, supporting the role of $PM_{2.5}$ as a trigger for acute cardiac events. Conversely, large population-based studies focusing on wildfire-$PM_{2.5}$ exposure show mixed results on cardiovascular effects. For example, (Liu et. al. (12)) observed no major difference in cardiovascular admissions between normal days, and “smoke wave” days, while (Hao et. al. (13)) found a modest but significant increase in the incidence of heart failure with increased average exposure of $PM_{2.5}$ over a 2-year period in Americans 65 years or older. Taken together, these studies suggest that wildfire exposure can affect cardiovascular health, but the magnitude and detectability depend on the outcome type, exposure resolution, and study design. Our findings complement this literature by demonstrating that at the province-year level in Canada, variation in heart-attack hospitalization rates is not predicted by changes in wildfire exposure, even though individual risks may be elevated during high-smoke periods.

This study has several strengths. First, its national, multi-year dataset covering all Canadian provinces, and territories allows us to examine wildfire-cardiovascular relationships across diverse geographic, climatic, and demographic contexts. Secondly, our study used a panel design with province fixed effect and control for time-invariant provincial characteristics, including healthcare, socioeconomic conditions, and baseline disease burden, that would otherwise confound the relationship between wildfire exposure and heart-attack rates. Lastly, the wildfire exposure index integrated various fire class sizes, capturing the overall severity of each province-year in one statistic, reducing multicollinearity between correlated fire metrics.

However, several limitations should be considered when interpreting these results. Firstly, the ecological panel design measures the exposure, and outcome at the province-year level, so the results cannot be interpreted as individual-risk estimates and can be susceptible to the ecological fallacy.

Secondly, a major limitation of this study is potential nondifferential exposure misclassification. The exposure index was based on fire size, and frequency, not individual or population-level $PM_{2.5}$ exposure. Larger fires in remote regions may have contributed heavily to the exposure index while potentially having a significantly lower relative exposure to humans than a smaller fire in a densely populated area. Because of this misclassification, the effect of the exposure index on heart-attack hospitalization rate may have been biased towards the null. Therefore, the absence of statistical significance should not be interpreted as evidence that wildfire smoke has no association with myocardial infraction (MI).

Thirdly, comparing our results to the finding of (Haikerwal et. al. (11)), we find that the annual time scale was likely to mask the

short-term effects of smoke exposure. (Haikerwal et. al. (11)) identified an association between $PM_{2.5}$ exposure, and acute cardiovascular effects, precisely because they measured exposure over short exposure windows. The temporal averaging of our study likely reduced the sensitivity to acute cardiovascular effects. For example, a province with a few dangerous smoke days would have been unlikely to produce any statistical significance as those days would be diluted in the data from that whole year, biasing results towards the null. It should be noted that there was a positive association, identified by (Hao et. al. (13)), between long-term smoke exposure, and the incidence of heart failure, but not MI.

We also lacked data on individual risk factors (e.g., smoking, hypertension, diabetes, socioeconomic status) and co-pollutants (e.g., non-wildfire $PM_{2.5}$, NO_2, ozone), which could confound any wildfire-MI relationship. Finally, our outcome was limited to hospitalized heart-attacks, so we could not capture out-of-hospital cardiac arrests, fatal MIs occurring before hospitalization, nonhospitalized ischemic events, unstable angina, or arrhythmias. Because wildfire smoke may precipitate sudden cardiac events or rhythm disturbances, these excluded outcomes may be among the cardiovascular events most sensitive to acute $PM_{2.5}$ exposure.

Taken together, these findings suggest that wildfire exposure at the province-year level within Canada does not have a clear effect on heart-attack hospitalization rates compared with secular declines over time, and provincial differences in cardiovascular burden. From a public-health perspective, while wildfire exposure remains an important factor in individual health, its contribution to overall annual heart-attack rates is modest at the scale of provincial health-system planning. Future research that links individual-level MI with high-resolution wildfire-specific $PM_{2.5}$ exposure, focusing on susceptible subgroups (e.g., 65+, preexisting cardiovascular disease) will be important to identify individual-level associations masked in aggregate provincial data.

Conclusion

This ecological observational time-series study examined the effects of wildfire intensity on age-standardized heart-attack hospitalization rates across Canadian provinces and territories from 2014–2022. There was no significant association between wildfire intensity and heart-attack hospitalization rates after controlling for year-to-year declines and province-fixed effects. Wildfire activity varied substantially across province-years, however most of the variation in heart-attack rates was explained by secular declines and provincial differences. At this scale, wildfires do not appear to be a main driver of myocardial infarction rates, even in the context of worsening fire seasons. Policy, and prevention should focus on traditional cardiovascular risks, and social determinants to reduce MI, while continuing to treat wildfires as an important environmental health issue, especially for respiratory disease.

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