ORIGINAL RESEARCH

The carbon footprint cost of travel to Canadian Urological Association conferences

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ABSTRACT

INTRODUCTION: Canadian Urological Association (CUA) conferences are held annually across Canada. Guests from across the world attended, contributing to the overall carbon footprint of the conference with their travel and accommodations. This study identified the carbon footprint of each of the 2016 (Vancouver), 2018 (Halifax), and 2019 (Quebec City) CUA conferences to investigate their carbon footprint and help determine the most eco-friendly location to hold future conferences.

METHODS: Registrant home institution was used to estimate the distance and method of transportation of attendee travel. Carbon footprint was calculated using an online calculator in tons of CO_2 equivalents (tCO_2). Total attendees, number of attendees driving, number of attendees flying, mean distance travelled per attendee, total carbon footprint, and average carbon footprint per attendee were calculated for each conference. Mean carbon footprint, and mean distance travelled were compared using a Brown-Forsythe ANOVA test, with Dunnett's T3 multiple comparisons test (α=0.05).

RESULTS: Vancouver had the largest number of attendees (n=473; 407 flying, 66 driving), followed by Halifax (n=382; 331 flying, 51 driving), and Quebec City (n=362; 265 flying, 97 driving). The mean distance attendees travelled was greatest for the Vancouver CUA (6041 km/roundtrip) compared to Quebec City (3096 km/roundtrip, $p<0.0001$) and Halifax (2985 km/roundtrip, $p<0.0001$). There was no difference in mean distance travelled between Halifax and Quebec City (p=0.95). The highest total carbon footprint was seen in Vancouver (tCO_2=447.76), followed by Quebec City (tCO_2=217.04) and Halifax (tCO_2=182.22). The average footprint per attendee was significantly higher in Vancouver (mean tCO_2=1.08) compared to both Quebec City (mean tCO_2=0.62, $p<0.0001$) and Halifax (mean tCO_2=0.52, $p<0.0001$). There was no difference in the average footprint between Halifax and Quebec City (p=0.63).

CONCLUSIONS: The estimated emissions associated with the Vancouver CUA conference is greater than both the Halifax and Quebec City locations combined. In-person conferences provide several benefits to the urological community. Incorporating environmental considerations into conference planning, such as conference location, could reduce the CUA conference's overall carbon footprint, mitigating the contribution to rising temperatures and negative health outcomes.

INTRODUCTION

The United Nations regards climate change as "one of the greatest challenges of our time."[1] Average global temperatures continue to rise, primarily due to anthropogenic release of greenhouse gases (GHGs) into the environment (i.e., carbon dioxide [CO_2]).[2] The effect on global climate and habitats are well-accepted, and recently numerous studies have shed light on the negative health effects associated with increasing temperatures — including exacerbations of urological conditions such as urolithiasis and infertility.[3-5]

Notwithstanding a two-year virtual delivery due to the COVID-19 pandemic, Canadian Urological Association (CUA) conferences are held annually across Canada, alternating between East, Central, and Western locations. Conferences are primarily attended by urologists from across the country, as well as allied health professionals, pharmaceutical representatives, and international guests — each contributing to the overall carbon footprint of the conference through extensive domestic and international travel. Previous studies examining the environmental impact of the American Urological Association (AUA) and European Association of Urology (EAU) conferences have found delegate travel was responsible for approximately 15 923 and 11 256 tonnes of emitted carbon equivalents (tCO_2), respectively.[6]

KEY MESSAGES

- The annual CUA general meeting sees attendees travel from across the country and the globe, ultimately contributing to detrimental carbon emissions.
- We set out to estimate the travel associated carbon footprint of the 2016, 2018, and 2019 general meetings.
- The chosen location of the conference matters; the estimated emissions associated with the Vancouver location is greater than both the Halifax and Quebec City locations combined.
- Given that travel accounts for the largest portion of medical conference carbon emissions, the choice of location should be done strategically.

Given the geographical expanse of our country, often requiring lengthy domestic and international flights to attend CUA conferences, we examined the carbon footprint of travel to three of the last in-person CUA conferences: Quebec City (2019), Halifax (2018), and Vancouver (2016). Through this, we hope to determine the impact of location on the carbon footprint of travel to CUA conferences and thus both inform individual awareness and educate future conference-specific decision-making.

METHODS

Anonymized registrant information was obtained through CUA administration offices for the 2016, 2018, and 2019 CUA conferences. The participant's listed home institution was considered their place of residence when estimating the distance travelled to the site of the conference. Industry attendees and registrants without a listed institution of origin were excluded from the analysis.

Google maps was used to estimate driving distance from the city centre of origin to city centre of conference location. Attendees from sites within three hours' drive from the city centre of conference location were assumed to be travelling by car (midrange vehicle, fuel efficiency= 8.42 L/100 km). Registrants residing greater than a three hours' drive away were assumed to have taken a round trip, economy flight, with no layovers from the nearest airport (measured by driving distance via Google Maps). Due to the 1.5–3-fold increase in emissions related to business and first-class travel, we conservatively assumed economy airline travel only.[7] Flight distances were calculated from the airport of departure to the airport of conference location. Carbon footprint was calculated using the *myclimate* online calculator in tons of CO_2 (tCO_2).[8]

Total attendees, number of attendees driving, number of attendees flying, mean distance travelled per attendee (km/roundtrip), total carbon footprint (tCO_2), and average carbon footprint per attendee (mean tCO_2) were calculated for each conference. Mean carbon footprint (mean tCO_2), and mean distance travelled (km/roundtrip) were then compared using a Brown-Forsythe ANOVA test, given lack of normality and variance within the data, followed by a Dunnett's T3 multiple comparisons test (α=0.05).

RESULTS

Vancouver had the largest number of attendees (n=473; 407 flying, 66 driving), followed by Halifax (n=382; 331 flying, 51 driving), and Quebec City (n=362; 265 flying, 97 driving). The mean distance attendees travelled was greatest for the Vancouver CUA (6041 km/roundtrip) compared to Quebec City (3096 km/roundtrip, $p<0.0001$) and Halifax (2985 km/roundtrip, $p<0.0001$) (Figure 1). There was no difference in mean distance travelled between Halifax and Quebec City ($p=0.95$). The highest total carbon footprint was seen in Vancouver (tCO_2=447.76), followed by Quebec City (tCO_2=217.04) and Halifax (tCO_2=182.22). The average footprint per attendee was significantly higher in Vancouver (mean tCO_2=1.08) compared to both Quebec City (mean tCO_2=0.62, $p<0.0001$) and Halifax (mean tCO_2=0.52, $p<0.0001$) (Figure 2). There was no difference in the average footprint between Halifax and Quebec City ($p=0.63$).

DISCUSSION

Travel to CUA conferences is associated with considerable carbon emissions and its magnitude may be related to conference location.

The total carbon footprint for the largest CUA meeting (447.76 tCO_2) was equivalent to the energy use of 51.2 homes or 87.5 gas-powered vehicles for a year. Further, the average carbon footprint per attendee for the same conference (mean tCO_2=1.08) was comparable to 2.5 months' worth of carbon emissions for the average person, or the equivalent amount of

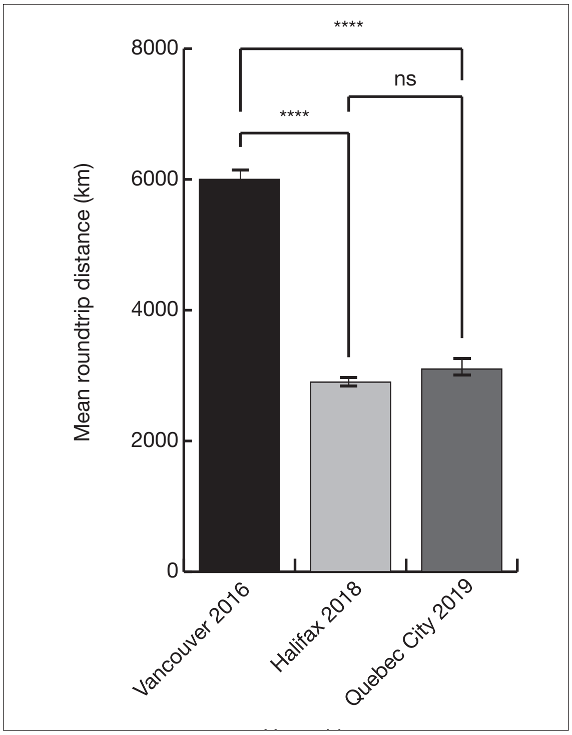

Figure 1. Comparison of mean roundtrip distance travelled (km) by attendees to the Quebec City (2019), Halifax (2018), and Vancouver (2016) CUA conferences (one-way ANOVA, Tukey's post-hoc test, α=0.05).

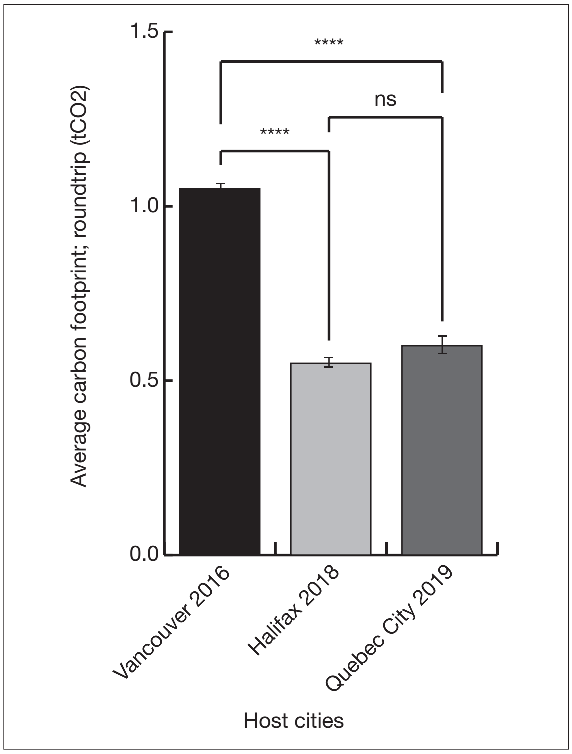

Figure 2. Comparison of average carbon footprint per attendee per roundtrip (mean tCO2) for the Quebec City (2019), Halifax (2018), and Vancouver (2016) CUA conferences (one-way ANOVA, Tukey's post hoc test, α=0.05).

carbon offset by planting 17.9 new seedlings. When compared to the estimated global average of 5 tCO_2 emitted per person, per year, it is clear that travel to CUA conferences alone is responsible for a considerable environmental impact.[9]

At the height of the COVID-19 pandemic, medical conferences were transitioned to an online format out of necessity, ultimately allowing for comparisons to in-person events. In a study examining the carbon cost of in-person vs. virtual conferences in the United Kingdom, emissions from virtual conferences were found to be 0.3–1.1% that of their in-person coutnerparts.[10] Further, in-person events have been shown to be associated with significant environmental impacts. Travel alone to AUA and EAU conferences was responsible for approximately 15 923 and 11 256 tCO_2, respectively. This level of emission is equivalent to approximately 40 and 28 million miles driven by an average gas-powered vehicle, respectively.[6]

The intention of outlining the environmental impact of in-person conferences is not to dissuade their attendance or undermine their importance, but rather to raise individual awareness and suggest environmental considerations into the decision-making process to assist a Canadian healthcare system that is responsible for approximately 4% of the national total of GHG emissions — corresponding to one of the highest healthcare emissions per capita in the world.[11] In-person conferences have developed as a mainstay among medical professions as a means of networking, knowledge dissemination, and fostering collegiality. Despite a higher environmental impact compared to their online contemporaries, traditional in-person conferences maximize the effectiveness of skill-based workshops, interactive seminars, and symposia by leveraging the unique collaboration and socialization of face-to-face interactions.[12] Most importantly, it has been demonstrated that physical attendance increases educational value, as conference learning objectives are better met in an in-person environment.[13]

Potential solutions to reduce contributions to global warming trends can be considered when planning CUA conferences in the future. Optimization of conference location could be the most impactful, as it has been demonstrated that travel may account for 88–96% of medical conference carbon emissions.[10,14] This does not require a permanent single conference location, as alternating between locations with higher and lower travel-related emissions is a possibility that has been previously explored with success.[15] Efforts to concentrate frequency of host cities to more central locations with extensive transport systems could alleviate travel distances within national attendees and thus reduce carbon footprints.

Further, although event location may be the most impactful manner to reduce carbon emissions, conference planning through an environmentally conscience lens allows for additional emission-reducing efforts to be explored. Reducing single-use items often given at conferences, such as lanyards, research booklets, posters, coffee cups, and catering, is an easy yet impactful start. After deciding on the conference location, hotels and venues that use eco-management or perform highly on the Hotel Carbon Measurement Initiative should be prioritized.

Finally, carbon offsetting programs can be implemented or encouraged by conference planners for attendees. Carbon offsetting is the reduction or removal of GHG (measured in CO2e) made to compensate for equivalent emissions produced elsewhere, often done by investing in renewable energy projects, such as hydroelectric dams and wind turbines, or energy-efficiency projects, such as developing energy-smart household appliances.[16] Opportunities to incorporate carbon-offsetting include a registration discount if participant purchased carbon offsetting through travel airline or including offsetting cost in registration fee as an opt-out. It should be noted that choosing a carbon-offsetting project should be done with care, as not all are created equal. It has been recommended that the project be approved by the government of Canada or the United Nations Clean Development Project.

Limitations

Due to incomplete data, this analysis did not include the travel-related emissions of industry or sponsor attendees, international speakers, spouses, or partners. Nor did we include the cost of non-travel-related sources, such as poster prints, presenter audiovisuals, single-use items, or catering. Factoring these in addition to the carbon cost of convention centers and hotels, the true carbon footprint-related cost of the conferences likely significantly underestimates the values we have reported. With the increasing popularity of electric vehicles and carpooling efforts, this assumption may be challenged in coming years. Further, more central locations, such as the Toronto CUA (2017) were not included due to incomplete registrant information.

CONCLUSIONS

Travel to CUA conferences is associated with a sizeable carbon footprint. Our results are unable to infer an ideal host city, as only three in-person conferences were considered. Moving forward, our association should strive to implement practices aimed at reducing the conference's overall carbon footprint.

COMPETING INTERESTS: The authors do not report any competing personal or financial interests related to this work.

This paper has been peer-reviewed.

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