Supplementary Materials for:

SOS! Summer of Smoke: a retrospective cohort study examining the cardiorespiratory impacts of a severe and prolonged wildfire season in Canada’s high subarctic.

A- Appendix 1: Conversion Factor for Nebulized Salbutamol to Salbutamol Administered via Metered Dose Inhaler

The Summer of Smoke study tracks the dispensation of outpatient doses of salbutamol, a beta-agonist, between years. Most salbutamol in Yellowknife is dispensed from pharmacies in the form of metered-dose inhalers (MDIs), meant to be used with a spacer, or in diskus form, but a small amount is dispensed in nebules. We wanted to analyze them together, and decided that the most clinically-relevant endpoint, a “dose,” would be the most useful.

Our efforts to find a standard conversion factor were not successful, so one was derived using a Cochrane review comparing nebulized salbutamol to salbutamol administered via MDI.

1-The standard outpatient salbutamol dose prescribed by Canadian doctors is 2 puffs by MDI or by diskus. We therefore decided: 1 salbutamol dose=2 puffs.

2-The Cochrane review, “Holding chambers (spacers) versus nebulisers for beta-agonist treatment of acute asthma,”(1) which found no significant advantage to nebulers over treatment with MDI and spacer, reported that, “The dosage ratio between delivery methods varied from 1:1 to 1: 13, with the larger doses administered via nebuliser. The median dose administered via nebuliser was four times that administered via spacer, a dosage ratio of 1:4 (interquartile range (IQR) 1:2 to 1:8).” There is substantial variability in doses: they state, “In clinical practice the dose of beta -agonist delivered to the airways varies depending on the type of nebuliser or spacer used and the characteristics of the individual’s airways at that time.”

3-To obtain a value for the purposes of our calculation, we divided the standard Canadian emergency room (ER) nebulized dose of salbutamol (2.5 mg) and divided it by the median dosage ratio of 1:4 from the Cochrane review (2.5mg/4=625mcg), reasoning that the average study would therefore have been comparing a 2.5mg nebulise to 625 mcg of MDI + spacer administered treatment.

4-We then used that ratio between nebules and MDI doses to determine a nebulise equivalent to the standard outpatient dose, which we’d defined as 2 puffs by MDI: 625mcg (ER dose MDI)/200mcg (outpt dose MDI)=about 3 fold difference between ER usual MDI dose and outpatient standard MDI dose.

5-To calculate a standardized outpatient dose of nebulized ventolin, we maintained equivalency to the MDI dose by also dividing by 3. 2.5mg/3= 833 mcg of nebulized ventolin= 1 standard outpatient dose nebulized ventolin.
Over the time interval that we are interested in, pharmacies dispensed nebules in 1mg, 2mg, 2.5mg and 5mg doses. The above ratio would make nebules equivalent to: 1mg nebule/833mcg=1.2 standard outpatient nebulized doses 2mg=2.4 standard outpatient doses 2.5mg=3 doses standard outpatient doses 5mg=6 doses standard outpatient doses

References: