Background Poor air quality is a global cause of respiratory disease[1]. Air pollutants including particulate matter (PM) with a diameter of 10 and 2.5 microns ($PM_{10,}$ $PM_{2.5}$), oxidized nitrogen compounds (NO_x), ozone (O_3) and volatile organic compounds (VOCs) impact health. People in developed countries spend ≥80% of their time indoors[1,2], highlighting the importance of *indoor* air pollution on health outcomes[3,4]. Marginalized populations, those with lower social determinants of health and urban dwellers are at higher risk of indoor exposures[5,6]. In spite of this, indoor sources remain poorly described[7–9]. Broad categories of potential contributors include: 1. Wood-burning appliances - Approximately 20% of Canadian primary residences use wood-burning devices[10], more commonly in rural and remote communities[11,12]; 2. Natural gas - a common issue[13], recently receiving increased public attention due to gas stove emissions[3,14]; 3. Cooking - regardless of energy source, cooking releases PM, NO_x, CO_2, and VOCs. Methods and hood fan use can influence air quality[13,15–17]; 4. Volatile chemical products - Indoor VOCs from scented, personal care and cleaning products, including secondary contaminants formed by chemical reactions, can be levels of magnitude higher than outdoors[9,18–24]. These are, at best, poorly characterized[25,26]. A 2022 American Thoracic Society workshop identified indoor air pollution as a significant knowledge gap that an initial survey of as few as 100 homes would help to address (manuscript in preparation).

Objective This interdisciplinary collaborative pilot project proposes a descriptive analysis aligning detailed home information, including appliances, household characteristics, activities, and product use with high sensitivity chemical analyses of air samples taken from each home.

Methods A consecutive sequence of homeowners participating in Canadian Institute of Public Health Inspectors Alberta-based training programs will be offered participation. Homes will be characterized through inspection results and a survey asking participants to detail appliances, household products and activities. Participants will sample air quality using a membrane passive sampler in a main household room and a silicone wristband for 2 weeks after the home inspection, then mail the samplers to the University of Alberta Department of Chemistry for analysis. Publicly available data will be used to correlate outdoor air quality by postal code. Exploratory semi-quantitative analysis of >10,000 compounds from passive sampling devices[27] will be performed using comprehensive two-dimensional gas chromatography – time- of-flight mass spectrometry (GC×GC-TOFMS)[28,29]. Separated analytes will be identified based on mass spectra, retention indices with advanced scripting techniques for mass spectral interpretation[28,29]. Descriptive analyses of study variables will be conducted in STATA version 13. Continuous outcome measures will be expressed in means +/- standard deviation (SD) for normally distributed and median +/- interquartile range (IQR) for non-normally distributed variables. Proportions and percentages will be used for categorical variables. Ethical approval will be obtained the University of Alberta Human Research Ethics Board.

Significance and impact of research Indoor air pollution has a critical influence on human health, however considerable knowledge gaps remain. Our unique and timely interdisciplinary collaboration will generate multifaceted data describing opportunities to *provide feasible options to improve population health through simple strategies including identifying products and activities that impact air quality* and builds future opportunities in this highly under-represented area of research.

Budget

Item	Unit cost	Tax	Unit total	Number	Total
Sampling devices and collection					
Membrane sampler - 1 per participating home + 5 controls	$35	$1.75	$36.75	105	$3,858.75
Silicone wristband - 1 per participating home + 5 controls (including preparation of sampler)	$2.50	$0.125	$2.625	105	$275.63
Postage-paid large sized envelope for returning devices - 1 per household; $2.00 postage + $0.50 envelope	$2.50	$0.125	$2.625	100	$262.50
Chemical analyses					
Analyte extraction	In-kind				
Chemical analyses	In-kind				
Participant recruitment and information packages					
Package preparation (paper copies) - 200	$2.00	$0.10	$2.10	200	$420.00
Dissemination to participating Canadian Institute of Public Health Inspectors training programs					$80.00
Total					**5,000.00**

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