CIHR IRSC

Canadian Institutes of Health Research | Instituts de recherche en santé du Canada

A Vision for a Healthier Future

Health Effects of Vaping End-of-Grant Workshop

WHAT WE HEARD REPORT

March 7th and 8th, 2023

Canadian Institutes of Health Research | Instituts de recherche en santé du Canada

Canada

Canadian Institutes of Health Research
At the Canadian Institutes of Health Research (CIHR), we know that research has the power to change lives. As Canada's health research investment agency, we collaborate with partners and researchers to support the discoveries and innovations that improve our health and strengthen our health care system.

160 Elgin Street, 9th Floor
Address Locator 4809A
Ottawa, Ontario K1A 0W9
www.cihr-irsc.gc.ca

CIHR Institute of Circulatory and Respiratory Health
The Institute of Circulatory and Respiratory Health (ICRH) supports research into causes, mechanisms, prevention, screening, diagnosis, treatment, support systems and palliation for a wide range of conditions associated with the heart, lung, brain (stroke), blood, blood vessels, critical care and sleep.

CIHR Institute of Cancer Research
The Institute of Cancer Research (ICR) funds cancer research in Canada based on internationally accepted standards of excellence, which bear on preventing and treating cancer, and improving the health and quality of life of cancer patients. CIHR is one of the leading cancer research funders in Canada.

CIHR Institute of Human Development, Child and Youth Health
The Institute of Human Development, Child and Youth Health (IHDCYH) supports research that ensures the best start in life for all Canadians and the achievement of their potential for optimal growth and development.

CIHR Institute of Neurosciences, Mental Health and Addiction
The Institute of Neurosciences, Mental Health and Addiction (INMHA) supports research to enhance mental health, neurological health, vision, hearing and cognitive functioning, and to reduce the burden of related disorders through prevention strategies, screening, diagnosis, treatment, support systems and palliation.

External Partner

Canadian Cancer Society
At the Canadian Cancer Society (CCS), our vision is a world where no one fears cancer. With the support of our volunteers and donors, we improve and save lives by taking a comprehensive approach to our work against more than 100 types of cancer. CCS funds research, provides services to those living with cancer, advocates on important cancer-related issues and educates and empowers people to make healthy choices.

Health Effects of Vaping End-of-Grant Workshop: What We Heard Report
Cat. No. MR4-187/2024E-PDF
ISBN 978-0-660-70953-6

This publication was produced by the Canadian Institutes of Health Research.

The views expressed herein do not necessarily reflect those of the Canadian Institutes of Health Research.

Photo credits
Page 1: Photo courtesy of Getty Images.

CIHR IRSC Canadian Institutes of Health Research Instituts de recherche en santé du Canada
Canadian Cancer Society Société canadienne du cancer

Table of Contents

Introductory Message from the Scientific Director

In July 2020, the Catalyst Grant: Health Effects of Vaping competition was launched in response to growing concerns with the rapid rise of vaping, particularly in the youth population in Canada. This funding opportunity was developed in partnership with the Canadian Institutes of Health Research (CIHR) Institutes of Cancer Research (CIHR-ICR), Circulatory and Respiratory Health (CIHR-ICRH), Human Development, Child and Youth Health (CIHR-IHDCYH), Neurosciences, Mental Health and Addiction (CIHR-INMHA) and the Canadian Cancer Society (CCS). This funding opportunity was created to support research aimed at further understanding vaping behaviours, the associated health effects (including vaping-associated lung illness [VALI] and other lung injury), vascular changes, and mental health and addiction impacts of vaping.

The Health Effects of Vaping End-of-Grant Workshop was hosted by the CIHR-ICRH in Ottawa over two days on March 7th and 8th, 2023. This two-day in-person workshop included poster sessions presenting the results from the projects of the 27 funded research teams, in addition to moderated panel discussions, breakout groups and plenary discussions.

We had the honour of Elder Verna McGregor opening and closing the workshop in a good way. We kicked off the workshop with Sonia Johnson, Director General of the Tobacco Control Directorate at Health Canada, with a keynote presentation on Canada's Policy Framework on Tobacco setting the stage for discussion over the next two days. The opening keynote was followed by a series of panel discussions that involved research team members, people with lived and living experience (PWLLE), including youth, healthcare providers, educators and policy makers. Panel discussion topics included: 1) Reproducibility, Rigour and Standardization of Measures; 2) Youth Vaping; and 3) Effective Mobilization of Evidence into Practice. On the second day, we heard about emerging controversies in vaping science, vape use and associated behaviours. Workshop participants then had the opportunity to break into small groups to share their knowledge, experiences, challenges and opportunities for collaboration, in addition to outlining priorities related to ongoing evidence gaps on the health effects of vaping, youth vaping, social and behavioural determinants of health, as well as policy and regulation. Finally, workshop participants were able to network and hear about the outcomes of the funded research through the poster presentation sessions.

This report summarizes the research findings presented, emerging gaps in evidence, research priorities and potential next steps related to the health effects of vaping.

Brian H. Rowe, MD, MSc, CCFP(EM), FCFP, FCCP, FCAHS
Scientific Director, CIHR Institute of Circulatory and Respiratory Health (CIHR-ICRH)
Professor, Department of Emergency Medicine and School of Public Health, University of Alberta

Workshop Objectives

1. Facilitate discussion of research results among research teams and relevant stakeholders.
2. Facilitate knowledge translation of new evidence to inform ongoing and future development of policies, practices and programs related to vaping.
3. Support discussion that will inform the development of an end-of grant report for the Catalyst Grant funding opportunity.
4. Identify the future direction of research and policy related to vaping, stemming from the evidence presented by research teams.

Agenda March 7th and 8th, 2023

Health Effects of Vaping End-of-Grant Workshop

Time (ET)	Item
	Day 1 – March 7th
8:45 a.m. – 9:15 a.m.	**Welcome and Overview**
9:15 a.m. – 10:15 a.m.	**Keynote:** *Canada's Policy Framework for Vaping and Tobacco*
10:20 a.m. – 11:20 a.m.	**Poster Session 1**
11:20 a.m. – 12:20 p.m.	**Moderated Panel Discussion:** *Reproducibility and Rigour – Development of Standard Measures*
12:20 p.m. – 1:20 p.m.	**Lunch**
1:20 p.m. – 2:40 p.m.	**Moderated Panel Discussion:** *Youth and Vaping*
2:45 p.m. – 3:45 p.m.	**Poster Session 2**
3:45 p.m. – 4:45 p.m.	**Moderated Panel Discussion:** *Effective Mobilization of Evidence into Practice*
4:45 p.m. – 5:00 p.m.	**Day 1 Closing Remarks**
	Day 2 – March 8th
8:45 a.m. – 9:15 a.m.	**Welcome and Overview**
9:15 a.m. – 10:20 a.m.	**Plenary Session:** *Emerging Controversies in Vaping Science – Use and Behaviours*
10:45 a.m. – 12:45 p.m.	**Breakout Groups and Moderated Report Back Discussion:** *Health Effects* *Policy and Regulation* *Social and Behavioural Determinants* *Youth Vaping*
12:45 p.m. – 1:00 p.m.	**Day 2 Closing and Wrap-up**

Keynote: Canada's Policy Framework for Vaping and Tobacco

Pictured: Sonia Johnson

Sonia Johnson, Director of the Tobacco Control Directorate at Health Canada, presented on Canada's Policy Framework for Vaping and Tobacco (**Figure 1**). Canada's Tobacco strategy aims for less than 5% of Canadians using tobacco by 2035. Smoking prevalence has declined to 16% (4.8 M Canadians) by 2018; however, another 2 million people in Canada will need to quit smoking to achieve the 2035 tobacco use target. Since Canada's tobacco strategy launched in 2018 smoking prevalence has declined and cigarette sales showed unprecedented declines. This period also included the implementation of a new framework for nicotine vaping products. The use of vaping products is a complex public health challenge as it represents both a health benefit as a cessation aid for the 3.8 million Canadians who smoke tobacco cigarettes, and a health harm to individuals, particularly youth who have never smoked. To address this challenge three strategies were identified: 1. For those who currently smoke – encourage cessation, or if a person is unable or unwilling to quit nicotine to completely switch to vaping; 2. For those who vape and formerly smoked – support sustained smoking abstinence; and 3. For those who have never smoked – focus on prevention and vaping cessation. In addition, focused and tailored strategies are needed as the burden of smoking is higher among certain populations within Canada. For example, First Nations (28% smoke), Métis (27% smoke) and Inuit (48% smoke) Peoples, those who work in construction (24%), and those with a mood and/or anxiety disorder (21%).

Vaping among Canadian youth doubled between 2017 and 2019, and stable in 2020 and 2021, yet remain at concerning levels. During this period (2019 to 2021), there was a significant increase in the proportion of youth who reported vaping to "reduce stress", which may be related to the impact of the pandemic. Of the non-smokers who vape, they are more often males in their 20s, do not identify as a visible minority and have a higher education. Polysubstance use is on the rise in younger populations (aged 15+), which includes the use of cigarettes, vapes, cannabis and/or alcohol. Just over 12% of Canadians reported use of at least two substances in the past 30 days, most commonly this included inhaled cannabis and alcohol. These findings demonstrate Canadians are using multiple substances and approaches that recognize and addresses the root causes of substance are required.

During the discussion, measures identified to protect youth and non-tobacco users from vape initiation included: packaging and labeling requirements, capping nicotine at 20 mg/ml, controlling the promotion and labeling of vape devices, product taxation, regulation enforcement and public education. Strategies to support people to quit using tobacco involved a harm reduction approach that included an equitable approach to public education, nicotine replacement therapies (including vaping), quitting services and awareness campaigns focused on youth. Also highlighted was a need for distinct programs designed by and for Indigenous Peoples to address the high rates of commercial tobacco use within their communities. Finally, evidence-informed approaches need to guide policy frameworks for vaping and tobacco.

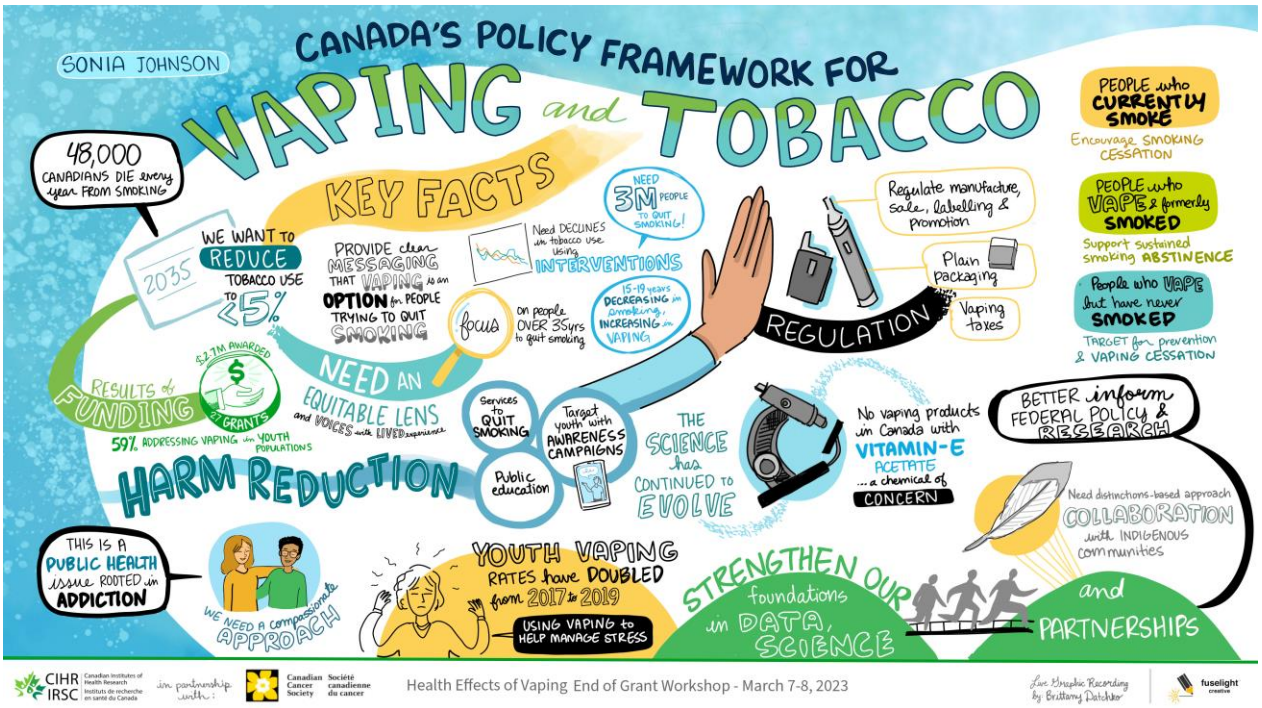

Figure 1. Canada's Policy Framework for Vaping and Tobacco

Panel 1 Summary: Reproducibility and Rigour – Development of Standard Measures

Pictured left to right: Michael Chaiton, Tracie Afifi, Harissios Vliagoftis, Margaret Kelly and Jude Frie

The first panel discussion focused on the reproducibility and rigour in vaping research (**Figure 2**). This session was moderated by Michael Chaiton (Centre for Addiction and Mental Health), with guest panelists from the funded research teams, Tracie Afifi (University of Manitoba), Harissios Vliagoftis (University of Alberta), Margaret Kelly (University of Calgary) and Jude Frie (University of Guelph). Reproducibility of research results in vaping research has been an issue due to the variability and number of vape devices, options of vape solutions, who is using the device and use behaviours. In addition, research measurement tools and methodologies have not been able to keep pace with these changes. Historically, vaping research was guided by cigarette use but it is becoming clear that cigarette use is not the same as vaping and is no longer a reliable starting point for developing research measures and tools. The measurement and methodological challenges have also limited opportunities for standardization and synthesis of data. Going forward, robust and continual communication across research pillars is key for replicating and understanding findings in this rapidly changing environment. Consistent and aligned messaging of what is known and not known, and the significance of both is key for communicating results to individuals who are considering using vaping devices, and for those who are current users. For example, lower concentrations of vape liquid components does not necessarily mean that it is proven to be safer.

Figure 2. Reproducibility and rigour: development of standard measures

Panel 2 Summary: Youth and Vaping

Pictured left to right: Christine Chambers, Lydia Zukewich, Zaina Edoo, Nikolai Vladimirovich Yanick, Ryan Fahey and Tea Rosic

The second panel discussion focused on youth vaping (**Figure 3**) and was moderated by Christine Chambers (CIHR-IHDCYH). The panelists included three youth with lived and/or living experience of vaping: Lydia Zukewich, Zaina Edoo and Nikolai Vladimirovich Yanick, as well as the project lead for the student-led Students Together Moving to Prevent Tobacco Use (STOMP) Project, Ryan Fahey (Physical and Health Education Canada) and a child psychiatrist, Tea Rosic (Children's Hospital of Eastern Ontario). The panelists discussed issues relating to the introduction of youth to vaping, why youth vape and factors related to vaping cessation. Based on their experience, the panelists described how peers are a primary reason that youth are introduced to and initiate vaping. Other major factors included ease of access, appealing flavours, attractive devices, use for entertainment to alleviate boredom and to manage stress.

When it comes to quitting vaping, although youth may feel effects on their health or performance, they do not have accessible sources for reliable information that supports vaping cessation. Peer groups can hinder the ability to quit vaping, as vaping is a social activity and thought to be safe compared to smoking. Also, youth need to have something to replace the social activity of vaping with friends. There is a lack of education in schools and there are challenges for clinicians to offer supports to those under the age of 18. Peer support, effective communication platforms and engaging preventative strategies were identified as

Figure 3. Youth and Vaping

possible ways to share information with youth, which can share potential health consequences and provide reasons to avoid becoming addicted and/or to motivate quitting. Youth indicated the need to have communication approaches be engaging (e.g., bi-directional and relatable) versus being "talked at". Youth also expressed an interest to be involved in the research and communication campaigns due to their growing concerns with the marketing of the devices and ease of access to vapes. A lack of access to information on the contents of vapes and the risks of vaping were cited as serious concerns from the panel members.

Panel 3 Summary: Effective Mobilization of Evidence into Practice

Pictured left to Right: Sonia Johnson, Terry Dean, Manuel Arango, Rob Cunningham and Lynda Balneaves

The final panel discussion focused on effective mobilization of evidence into practice (**Figure 4**). Sonia Johnson (Health Canada) moderated the session, with panelist members Terry Dean (Canadian Lung Association), Manuel Arango (Heart & Stroke), Rob Cunningham (Canadian Cancer Society), and Lynda Balneaves (University of Manitoba) sharing their perspectives. Panel members identified several challenges including how to balance vaping as a smoking cessation aid without re-normalizing smoking or promoting vaping unintentionally.

More data are needed on whether vaping is an effective tool for smoking cessation when provided through retail versus under physician supervision in combination with other cessation supports. Access to products online poses a further challenge when considering prescription-based approaches. Furthermore, the

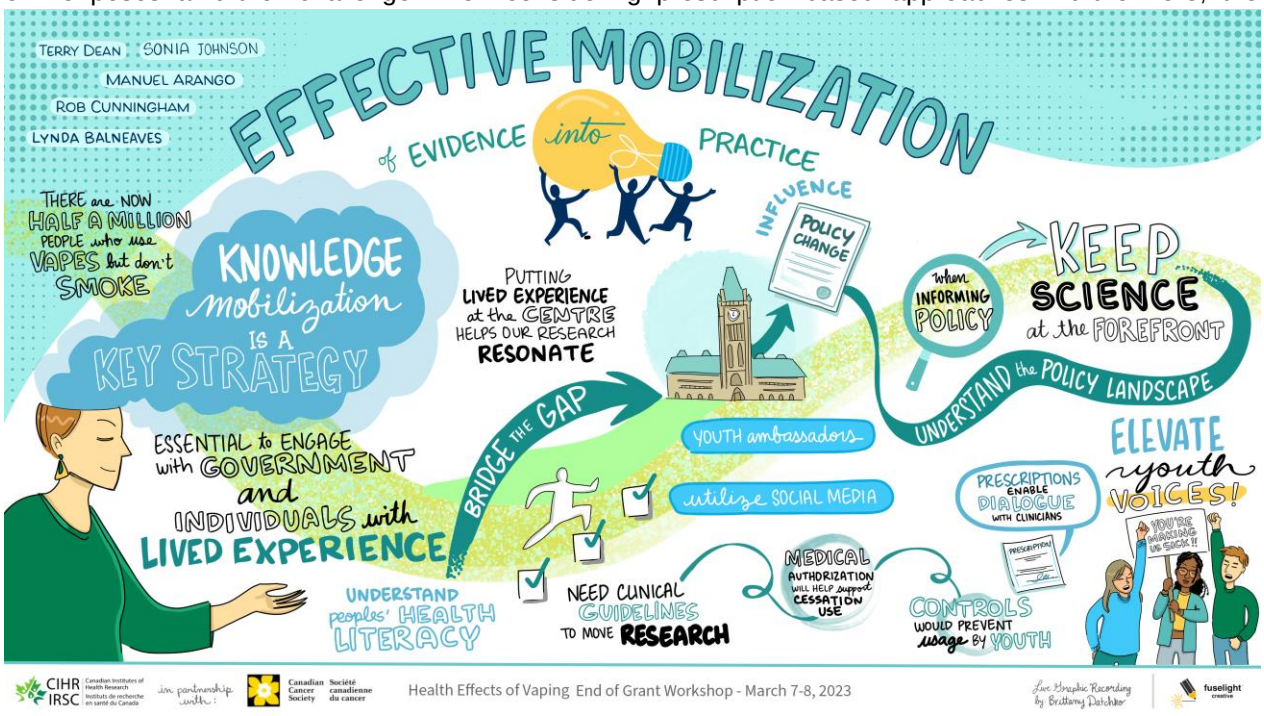

Figure 4. Effective Mobilization of Evidence into Practice

prevalence of people who have previously quit smoking who are coming back to the nicotine market through vaping is unclear. Polysubstance use is another challenge as vaping is used for inhalation of other substances, such as cannabis, which includes use for self-medication. Data collected from surveillance tools would be helpful for monitoring this issue and patterns in multiple inhalant use if made accessible to policymakers.

Regarding the communication of research results, the importance of non-judgmental, inclusive and accessible language use was highlighted. It was suggested that key messaging should be tailored to target audiences. Co-development of communication materials with youth and other impacted groups could facilitate this. For campaigns, researchers and policymakers, the use of marketing designers, social media experts, or even influencers were identified to help create effective campaigns to promote potential uses and risks of vaping devices for specific audiences (i.e., youth vs adults). For healthcare providers, providing reliable sources of summarized evidence that can be quickly reviewed would be highly beneficial.

Plenary Session: Emerging Controversies in Vaping Science – Use and Behaviours

Pictured left to right: Fei-Fei Liu, Adam Cole and Shawn O'Connor

The Plenary Session **(Figure 5**) was moderated by Fei-Fei Liu (CIHR-ICR).

Presentation 1: Adam Cole

Adam Cole (Ontario Tech University) presented on vaping in the context of nicotine delivery. Factors associated with vaping included susceptibility to future substance use (including tobacco), sensation seeking, poor mental health and exposure to e-cigarette marketing. The initiation of vaping is influenced by smoking status, sex/gender, social context/friends vaping and cannabis use. Regarding youth and physical activity, those involved in strength training, intramural sport, varsity teams (such as wrestling, baseball and softball), and those in competitive sport are more likely to report vaping. The percentage of youth attempting to quit vaping increased from 2017 to 2019.

Within the context of COVID-19, there was a plateau in youth vaping compared to previous years. A COVID-19 pandemic study showed that 19% of individuals reported a decrease in vaping, 30% reported an increase in vaping, while 50% reported no change. One of the studies using COMPASS data showed that monthly vaping decreased in both males and females from 2019 to 2020, but more so among male students. COVID restrictions may have limited the social aspect of vaping, but students still vaped with friends, both in person and virtually.

Youth vaping is dynamic and is affected by external and internal factors. As such, our understanding remains limited within this evolving context. Challenges include the constantly changing devices, terminology used by youth, and substances that can be used in vaping devices. Research has focused mainly on vaping initiation and not as much on ongoing vaping behaviours. There is less qualitative data to understand why youth vape as opposed to who vapes. Finally, there is a need for evidence of effective interventions to prevent vaping among non-smokers as well as additional research on vaping cessation and post-pandemic youth vaping.

Presentation 2: Shawn O'Connor

Shawn O'Connor (University of Toronto) presented on emerging issues and controversies around vaping in Canada. Among adults, prevalence of cigarette use remains higher than vaping, although cigarette use is dropping. Nicotine use, however, has stayed consistent. In those 15-19 and 20-24 years old, e-cigarette use has increased while cigarette use has dropped. In both groups, overall nicotine use has stayed consistent. Social exposure to vaping increases in early high school grades, with vape usage rates increasing from grades 9 to 12. Without policy or programming changes, vaping rates will continue to increase as those who started will continue and more youth will start vaping as they age.

The messaging is very mixed for youth across substances. The current messaging for nicotine reduction is "do not smoke" versus "do not consume nicotine". A more holistic approach across research, regulators and government departments could allow for more effective messaging. Strong taxation of both cigarettes and e-cigarettes may reduce the uptake of vaping products. Prohibited flavour vaping products continue to be advertised, are accessible online and manufacturers use packaging that is more enticing to youth. In a real-world online research study, a youth confederate was able to purchase e-liquid from online vape shops 90% of the time and have the product delivered without age verification from delivery agents 44.5% of the time. Online retailers, as well as the contracted delivery services, need to do a better job at preventing youth from being able to purchase prohibited products.

Finally, stealth vaping was discussed, with a demonstration of techniques and currently available products for use with vaping devices without detection (e.g., drawstrings on a hoodie, watch).

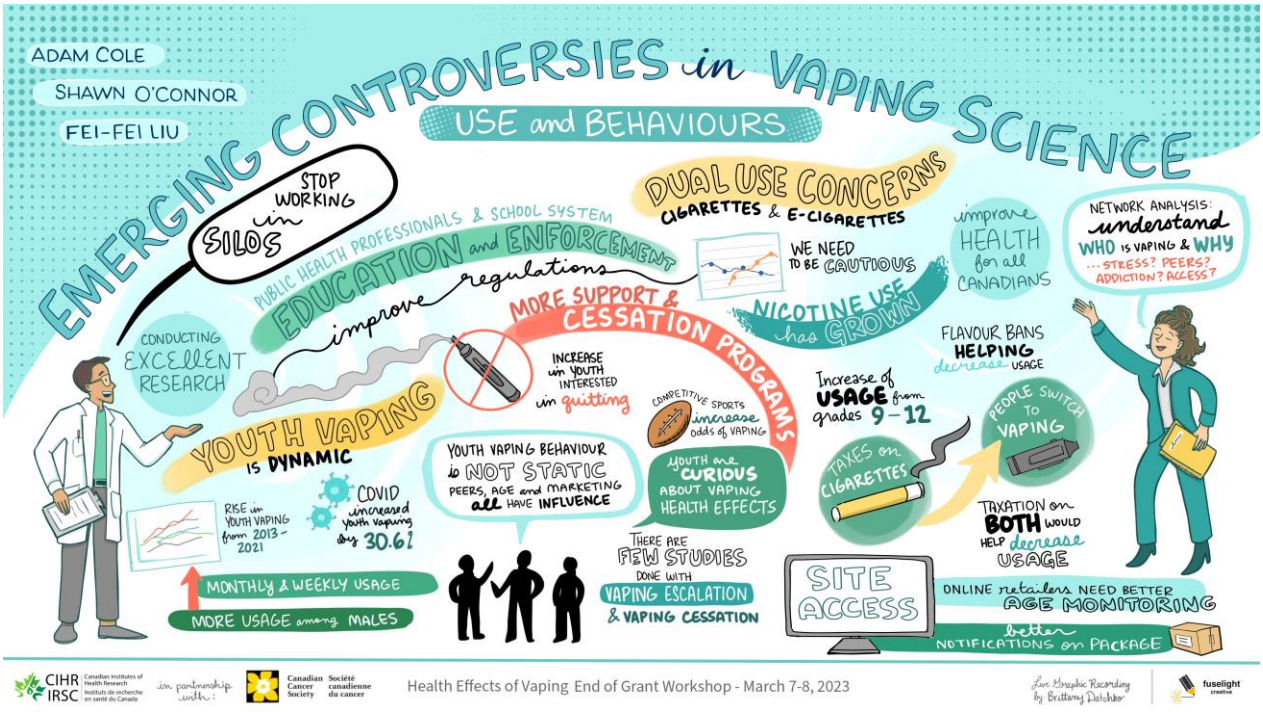

Figure 5. Emerging Controversies in Vaping Science: Use and Behaviours

Breakout Groups – Evidence Gaps

Pictured: Ryan Perry

On Day 2 of the workshop, participants engaged in breakout groups to discuss one of the following topics: policy and regulation; social and behavioral determinants; youth vaping; or the health effects of vaping (**Figure 6**). Breakout groups had 45 minutes to discuss research priorities, current opportunities and key unanswered research questions related to the topic area, followed by a report-back session moderated by Ryan Perry (CIHR-ICRH). Several key themes emerged from these discussions, which are outlined in further detail below.

What are the broad research priorities that need to be addressed?

Harms and Benefits

Participants discussed the lack of awareness on the composition of vaping liquids. One prevalent misconception identified was related to liquid components that are identified as safe for ingestion are also being considered safe for inhalation. There is a need to understand the composition and toxicology of vaping liquids along with the device as a whole, as elements of the delivery mechanism can also be part of what is inhaled. Environmental considerations should also be addressed, such as the need for a solution for recycling vape products. Participants were concerned about how to prevent people from initiating vaping when using vaping as a harm reduction method for smoking cessation. Participants also discussed that vaping was less stigmatizing compared to smoking, due to use being less noticeable as well as the perception of being a safe product. Although the knowledge and lessons learned from the tobacco and cannabis research space can be leveraged, vaping is different on many levels (e.g., behaviours, unit measurement and health effects), which may lead to missing essential data by direct comparison with tobacco use.

Engagement and Experience of People Who Vape

A number of knowledge gaps were identified as related to understanding behaviours (including stigma amongst youth), knowledge and experiences of people who vape, including: Why do individuals vape (including youth)?; What are the patterns of use including polysubstance use and substance use after vaping cessation?; Where are the sources used/available for products and information on health effects?; and, Why are youth curious about vape shops? Moving forward, it was recommended that future research address the heterogeneity of those who only vape versus dual users, those who vape nicotine versus cannabis, use among different marginalized communities, use by youth versus older adults and during the ante-partum/post-partum period. Participants agreed on the need for community engagement, engagement and empowerment of youth to build a narrative and for peer engagement strategies to inform future research activities.

What are the current opportunities that can be leveraged to continue or establish research activities?

Data Collection and Standardization

Vaping research will benefit from standardization of data and assessment tools, including the categorization of vape products (active substances, carrier liquids and brands), speed of delivery patterns of use, co-exposure to other substances, and standardization of population health questions about vaping. Participants identified the need for more comprehensive data collection and raised concerns regarding how much data is being missed because it is not captured systematically. This includes measures of user

behavior, social determinants and mental health conditions. Incorporating vaping related questions on established surveys and/or during healthcare visits was one potential method to collect vaping data. It was also recommended that future research activities integrate an equity framework to help identify variation in health effects and use behaviour amongst groups such as different marginalized communities and younger vape users. When developing an equity framework, inclusion of both quantitative and qualitative assessment measures and tools was strongly recommended.

Collaboration

To support effective knowledge mobilization, participants discussed the need to break down silos in the research and policy space, identify ways to enable a wholistic and interdisciplinary approach to evidence generation and mobilization, and consider developing a national task force on vaping. This includes understanding vaping on a global scale and how regional differences may inform this. There was also a recommendation for government to take on a greater leadership role to support the regulation, standardization and availability of devices on the market. Other opportunities to support interdisciplinary collaborations included development of a standardized data platform through a coalition of researchers and policymakers and a national cohort on youth vaping to understand the long-term health effects.

Education and Knowledge Mobilization

Up-to-date education and communication surrounding the health effects of vaping are important. Education and access to evidence that supports knowledge mobilization are also required for youth allies such as parents, guardians, clinicians, teachers and coaches. To facilitate this, targeted knowledge products such as practice guidelines for healthcare providers and educational materials focused on youth, parents/guardians, teachers, coaches, adults or other diverse audiences are needed. Knowledge products need to be in accessible and plain language to help with understanding, uptake and use of the evidence on health effects of vaping. Collaboration with social media intermediaries could be an approach to collect data and monitor trends, and to tailor messaging to diverse audiences. Opportunities for knowledge sharing and exchange among researchers is also needed to facilitate discussion of research findings across research pillars and policy implications. Involvement of PWLLE will be a key component to improving communication and knowledge mobilization of vaping research results.

Figure 6. Breakout Discussions

Key unanswered research questions identified:

1. What is inside of a vape device? What is in a puff?
2. Are there other, safer, ways to deliver nicotine?
3. What effects does vaping have on the developing brain?
4. How are people making a risk-benefit analysis for the use of vapes? Where are they getting their information?
5. What are the long-term health impacts of vaping?
6. What are the effects of polysubstance use, including pharmaceuticals?
7. What are the differences in vape use across sex, gender, and age? Are some youths more or less affected?
8. What substances and vaping products are youth using?
9. What are the patterns of vape use?
10. How do you measure exposure clinically?
11. Why are individuals vaping? Can we address that gap?
12. When stopping vaping are people replacing it with another substance?
13. How do we prevent new use and help those to stop smoking? Can we look at the cannabis industry? Are there parallels or opportunities?
14. How can we provide evidence from research findings to government and policy makers more quickly?
15. How do you create recognition that vaping isn't the thing to do? Can policy help address the curiosity of vaping in youth?

Concluding Message from the Scientific Director

Dr. Brian H. Rowe
Scientific Director,
CIHR-ICRH

On behalf of the Canadian Institutes of Health Research (CIHR) and the CIHR Institute of Circulatory and Respiratory Health, I would like to thank the event participants who attended and participated in the **Health Effects of Vaping End-of-Grant Workshop.** With nearly 100 people coming together over two days including a diverse group of healthcare workers, policymakers, funders and youth with lived or living experience of vaping, fulsome discussions were enabled through the sharing of experiences, research results, concerns and policy actions related to the health effects and risks of vaping.

The workshop provided an engaging forum to build on previous conversations around challenges and opportunities when conducting vaping research that took place at the **Health Effects of Vaping Virtual Collaborative Forum** in April 2022. The panel discussions, keynote presentations and poster sessions facilitated the mobilization of research results, which we hope will encourage ongoing and future development of policies, practices and programs related to vaping. Key topics addressed were Canada's policy framework for vaping and tobacco, and the further exploration of emerging controversies surrounding vaping use and behaviours. The development of standard measures to support reporting and rigour were discussed in greater detail along with emerging challenges in operationalizing health research in this space. As many of you expressed, the context of the vaping landscape is ever-changing, which creates not only new challenges, but also new opportunities for research and the methodologies used to generate high-quality evidence and subsequent knowledge mobilization.

Emerging gaps in evidence that were identified in 2020 were validated along with new evidence gaps identified for future exploration. CIHR is pleased to share the findings from the catalyst grant projects within this report, as well as a synthesized summary of what we heard at the end-of-grant workshop.

Thank you for sharing your experiences and collaborating with those who were gathered at the event in March. It was clear that we all share a common interest in advancing *Better Health for All* people living in Canada powered by outstanding research.

Brian H. Rowe, MD, MSc, CCFP(EM), FCFP, FCCP, FCAHS
Scientific Director, CIHR Institute of Circulatory and Respiratory Health (CIHR-ICRH)
Professor, Department of Emergency Medicine and School of Public Health, University of Alberta

Project Summaries

Poster # 1

Are e-cigarettes Really a Healthy Alternative to Combustible Cigarettes? Cardiorespiratory, Immune and Thrombotic Responses to Smoking e-cigarettes vs Combustible Cigarettes Under Conditions of Physical and Mental Stress

Nominated Principal Investigator: Simon Bacon*, Professor, Department of Health, Kinesiology, and Applied Physiology, Concordia University*

Principal Investigator(s): Kim Lavoie

Co-investigator(s): Jean Bourbeau, Styliani Daskalopoulou, Mathieu Morissette, Nicola Paine, Robert D Reid

Smoking is key to developing a series of chronic diseases, such as heart disease, stroke, and cancer. Electronic cigarette (e-cig) use is on the rise. This is in part because people think that they are “healthy” alternatives to regular cigarettes, and they might help smokers quit smoking. Despite their popularity, very little is known about their safety and impacts on health. For example, in 2020, there were a series of severe acute e-cig related events, which led to a number of hospitalisations. In a group of young and healthy individuals, our study looks at how smoking e-cigs versus regular cigarettes versus nothing affects the bodies responses during low intensity exercise and mental stress. For example, we can see how acute e-cig use affects things like heart rate, blood pressure, how thick blood gets, and breathing, which may help us understand risk for acute and chronic diseases. To date, we have seen that e-cigs have notable impacts on a number of different physiological responses, some of which are negative and some which are worse than regular cigarette use. We have also seen differences in responses in females and males, suggesting that not all responses are universal.

Poster # 2

Lung Health Benefits of e-cigarette Cessation

Nominated Principal Investigator: Christopher Carlsten*, Professor, Department of Medicine, Respiratory Division, University of British Columbia*

Principal Investigator(s): Laura L Struik

Co-investigator(s): Milan Khara, Tina Afshar

The use of e-cigarettes (vaping) among young adults, has been increasing in Canada. Vaping has been shown to cause irreversible damage to the lungs. However, there is limited research on providing quitting support, particularly for tobacco-naïve young adults. The first objective of our project is to understand how stopping vaping for 72 hours affects the lung health of young adults who otherwise vape regularly. The second is to determine if giving personalized lung health feedback to the individual affects their motivation to quit vaping. Thirty individuals, aged 19-35, who vape regularly will be recruited to this study. Each participant will be asked to stop vaping for 72 hours, and attend four, consecutive, in-person visits during this time. In each visit, measures of lung health and function will be taken, including nitric oxide concentrations in breath, and motivation to quit will be assessed. After completing the in-person visits, each participant’s data will be summarized in a biofeedback report, which will then be presented to the participant. Following biofeedback, motivation to quit vaping will be reassessed, and a semi-structured,

one-on-one interview will be done to better understand their experience quitting vaping and receiving personalized biofeedback.

Poster # 3

Vaping: The Unknown Perils of Inhalation and Epithelial Injury

Nominated Principal Investigator: Delbert Dorscheid*, Associate Professor, University of British Columbia*

Co-investigator(s): Tawimas Shaipanich, Janice Leung, Gurpreet Singhera

About one in 5 adolescents aged 15 to 17 reported using electronic cigarettes, or vaping, in the previous 30 days with this proportion reported to have increased from 2015 to 2019. Vaping may result in vaping-associated lung injury, a condition causing shortness of breath, chest pain, and in serious cases, death. Despite vaping's prevalence, its long-term effect and how it can damage the lungs is not well understood. In this project, we studied how chronic vaping exposure may change the function of the airway epithelium, which is the protective lining of our lungs. To do this, we designed an enclosure that allows us to deliver different concentrations of vape aerosol to airway epithelial cells in a manner that mimics how someone normally uses a vaping device. We found that exposure to vaping lead to increased measurements for cell death and reduced how quickly the airway epithelium can repair after injury. Our findings may shed light on the mechanism behind how vaping can damage the lungs, hypothesize how vaping may interact with other chronic lung diseases such as asthma, and highlight possible ways to combat this disease.

Poster # 4

Vaping Safety: A Knowledge Synthesis

Nominated Principal Investigator: Mark Eisenberg*, James McGill Professor of Medicine, Jewish General Hospital, McGill University*

Co-investigator(s): Andrea Benedetti, Carolyn N Ells, Kristian B Filion, Andrea S Gershon, Genevieve Gore, Roland M Grad, Brett D Thombs

E-cigarette use, known as vaping, has surged in popularity among children and youth since its introduction in the mid-2000s. In 2021, the prevalence of current e-cigarette use among persons aged 8 to 20 across 69 countries and territories was 7.8%. Due to rising e-cigarette use prevalence and associated health risks, vaping prevention interventions have been introduced. Regulatory strategies, such as legislation and policies, have been enacted at the federal, provincial/state and municipal levels. Non-regulatory interventions are typically directed towards the individual, school students or in communities. We conducted two systematic reviews summarizing the effectiveness of regulatory and non-regulatory interventions, which included 30 and 39 publications, respectively. On the regulatory side, flavor bans, sales licenses, warning labels, taxation and mixed regulations were effective at the provincial/state and national levels. Amongst non-regulatory strategies, e-cigarette use prevention was associated with high perceived parental monitoring; however, the study design precludes causal claims. Social-emotional skills curricula and peer leader programming showed promising but limited evidence to prevent vaping initiation. We conclude that regulatory strategies hold more merit for youth vaping prevention than non-regulatory ones, but that combining a variety of strategies is more effective than any individual intervention.

Poster # 5

Impact of Cannabis Vapor Exposure on Primary Human Airway Epithelial Cell Immune Responses

Nominated Principal Investigator: Jeremy Hirota*, Associate Professor, McMaster University*

Principal Investigator(s): James MacKillop

Co-investigator(s): Andrew C Doxey, Martin R Stampfli

The lungs are in constant contact with viruses capable of infecting the respiratory tract; yet we rarely show signs of infection. Minimized infection is the result of a coordinated response of the respiratory mucosa that includes the physical barrier and immunological functions of the epithelium. Despite this tiered defence strategy, protection rendered by the epithelium can be compromised by inhaled of noxious substances. Our overarching hypothesis was that cannabis vapor exposure increases influenza A virus replication, reduces antiviral immune responses, and potentiates pro-inflammatory responses in human airway epithelial cells. We results have developed and refined cannabis smoke and vaping exposure protocols with primary human airway epithelial cells and the Calu-3 epithelial cell line, both grown at air-liquid interface on Transwell membrane inserts. We have also explored combination exposures of cannabis smoke or vapor in conjunction with H1N1 infection. Our results are preliminary and suggest caution should be taken in heads up comparisons of experimental models of combustion vs vaping. Both cannabis smoking and vaping induced changes in epithelial cell barrier function, which may exacerbate subsequent H1N1 infection.

Poster # 6

The Effect of Vaping-Associated Lung Injury on Lung Epithelium

Nominated Principal Investigator: Margaret Kelly*, Professor, Department of Pathology and Laboratory Medicine, University of Calgary*

Principal Investigator(s): Mark A Anselmo, Matthias W Amrein, Mark R Gillrie, David Proud

“Vaping”, (inhaling aerosolized liquids or vapor from an electronic device), has been tried by up to 20% of Canadians. There is very little scientific data on the safety of this practice although it is advertised as being safe and a good alternative to smoking traditional combustible cigarettes. We know that vaping can produce lung injury in some people, causing severe inflammation and scarring in the lung and sometimes death. Substances in the vapor may damage cells in the lungs called alveolar epithelial cells which secrete surfactant, a liquid vital for the proper function of the lung. In our study, we take these lung cells and grow them in the lab and expose them to different components and concentrations of the vape liquids. The resultant effects on the cells can be studied by examining changes in what they secrete. We will also take sections from lungs of patients with vaping-associated injury and look for similar changes in the cells as seen in cell culture. We hope to identify the underlying mechanism of damage by vaping and therefore develop therapies to treat it.

Poster # 7

Utility of a Preclinical Model to Study the Impact of Vaping Products on Cardiopulmonary Outcomes

Nominated Principal Investigator: Koren Mann*, Professor/Chair, Department of Pharmacology and Therapeutics, McGill University*

Principal Investigator(s): Carolyn Baglole

Co-investigator(s): Jorg H Fritz

New animal models are needed in order to predict the long-term health consequences of e-cigarette use. In particular, these models need to be flexible enough to accommodate the ever-changing landscape of vaping products, including devices and liquids. Ideally, the preclinical models will also allow investigators to ask questions regarding co-exposures that could modulate (worsen or prevent) the health consequences of vaping. To this end, Drs. Baglole and Mann have developed mouse models to define changes to the immune, pulmonary and vascular systems following e-cigarette exposure that reflects how these products are used by humans. They have defined exposures that reflect both light and moderate users and identified changes in the lungs that occur even from acute and sub-chronic exposures. Further, they have developed an inducible model of atherosclerosis that will now allow investigation into whether vaping in adolescence can predispose a person to cardiovascular disease later-in-life. Importantly, with only one year of funding from the Catalyst Grant, this collaboration has generated 3 published/submitted peer-reviewed papers. Finally, they are now addressing outstanding questions on vaping, including possible sex-specific changes, co-morbidities (i.e. asthma and viral/bacterial infection) and the influence of diet on cardiopulmonary outcomes including inflammation and oxidative stress.

Poster # 8

Understanding the Impact of Vaping on Innate Immunity to Respiratory Viruses

Nominated Principal Investigator: Theo Moraes*, Pediatric Respirologist, The Hospital for Sick Children (SickKids), University of Toronto*

Principal Investigator(s): Piushkumar Mandhane

Co-investigator(s): Laurie A Zawertailo

Since 2010, the inhalation of e-cigarette vapor or ‘vaping’ has risen exponentially among smokers and non-smokers. E-cigarettes typically contain nicotine, flavoring agents, and the delivery vehicles propylene glycol (PG) and vegetable glycerol (VG). The impacts of chronic vaping on the lung and how to avoid any potentially harmful effects are unknown. This research project will investigate the impact of vaping on mucociliary clearance and lung inflammation in primary human nasal epithelial cells(HNECs). Healthy control cells will be cultured at air-liquid interface (ALI) and will be exposed to aerosolized STLTH flavorless vaping product containing 2% nicotine or PG/VG vehicle control using a Vaping Product Exposure System (VaPES) for a total of 40 puffs/day every 5 minutes. After vaping exposure, ion channel activity will be measured using an Ussing chamber and cells will be examined using a fluorescent-bead tracking assay for mucociliary function. To measure inflammation after exposure, cytokine expression will be analyzed using ELISA or Luminex and by RNAseq/PCR for gene expression. Protein expression will be measured using western blot and/or immunohistochemistry. Investigating the relevant impacts of vaping on airway epithelial cells can be used to inform recommendations on the safety of chronic vaping and explore approaches to mitigate these risks.

Poster # 9

Novel Pulmonary Imaging of Lung Structure and Function in Symptomatic and Asymptomatic e-cigarette Smokers

Nominated Principal Investigator: Grace Parraga*, Tier 1 CRC and Professor, Department of Medicine, Western University*

Principal Investigator(s): Constance A Mackenzie

Co-investigator(s): Karen J Bosma, Inderdeep Dhaliwal, Alexei Ouriadov

During the pandemic, we developed a new pulmonary magnetic resonance imaging approach using hyperpolarized 129Xe gas for application to youth who use e-cigarettes. 129Xe is a stable, inert, abundant, non-radioactive isotope of xenon which is gaseous at room temperatures and pressures. It may be laser polarized by virtue of an uneven number (unpaired) nuclear protons so that it remains MRI opaque, even when inhaled into the lungs. We substantially advanced the capabilities of this approach to measure both inhaled gas distribution (or ventilation), and now pulmonary gas-exchange, on a regional basis throughout the lung and with high spatial resolution. Using this novel method and in anticipation of the reopening of our research facility post-COVID for high-throughput patient-based, face-to-face studies, we measured both pulmonary ventilation as well as gas-exchange in healthy never-smoker, never-vaper participants who also had not experienced COVID-19 infection and stratified these results by sex and age. We completed ventilation MRI in asymptomatic males (mean age 25) who regularly vape and will acquire gas-exchange data in vaping participants for comparison to healthy volunteers. We have published the results of this method in participants with post-acute COVID-19 syndrome and in asymptomatic, previously undetected, large atrial septal defect.

Poster # 10

Understanding the Pathology of Vaping Associated Lung Damage in Young Adults

Nominated Principal Investigator: Christopher Pascoe*, Assistant Professor, Department of Physiology and Pathophysiology, University of Manitoba*

Co-investigator(s): Neil Johnston, Andrew J Halayko, Biniam Kidane, Paul Wawryko

E-cigarette use among youth and adults is on the rise. 20% of young people believe that vaping is harmless. Although an increasing number of research studies highlight health concerns, more young people who have never smoked before are now using e-cigarette devices. Unfortunately, we do not know how e-cigarette use damages the lung tissue, in part due to problems getting tissue to study. This limits our ability to understand whether long term use of e-cigarette devices causes damage to the lungs, similar to long term use of traditional cigarettes. In this study, we recruited young adults who need surgery for a collapsed lung and asked them about their e-cigarette use history. This unique population provided us with access to lung tissue that is normally difficult to procure. We sequenced the RNA in this lung tissue to look for signatures related to e-cigarette use. We find that people who use e-cigarette devices have significant changes in the RNA profiles in their lungs that mimic changes seen in other chronic lung diseases. These changes may be early indicators that long-term e-cigarette use could result in the development of chronic lung disease similar to use of traditional cigarettes.

Poster # 11

Effects of e-cigarettes on Lung Health: The VAPE Study (Vaping's Airway and Lung Parenchymal Effects)

Nominated Principal Investigator: Don Sin*, Professor of Medicine, University of British Columbia*

Co-investigator(s): Menn Biagtan, Rachel L Eddy, Miranda A Kirby, Jonathon Leipsic, Janice Leung

There is little information on the lung health effects of vaping from both early and long-term exposures that may lead to vaping-associated lung illness. Here we aim to measure the pulmonary effects of e-cigarettes in healthy young volunteers using chest computed tomography (CT), hyperpolarized 129Xe magnetic resonance imaging (XeMRI) and bronchoscopy (which will be reported later). XeMRI gas exchange was measured as inhaled xenon gas concentrations in the airspaces, and dissolved xenon in the lung tissue (or alveolar membrane) and red blood cells (RBC). To date, we have enrolled seven daily vape users (n=4 nicotine, n=3 THC/CBD). All pulmonary function test measurements were normal and there were no structural lung abnormalities on thoracic CT. Compared with published healthy references, one participant had normal XeMRI gas exchange (nicotine), two had increased membrane xenon uptake (1 nicotine, 1 THC/CBD), one had reduced membrane uptake (nicotine), and three had reduced RBC xenon uptake (1 nicotine, 2 THC/CBD). These data suggest despite normal lung function, disturbances in gas exchange are common among young persons, who regularly vape. These data raise the possibility that long-term vaping may cause small airway dysfunction. Imaging and bronchoscopy results in vaping-only participants will later be compared with cannabis-only smokers and combined cannabis+vaping smokers to evaluate any differences between combustible and electronic smoking exposures.

Poster # 12

Visualizing the Effects of e-cigarette Vape on Alveolar Macrophage Function Using a Mouse Model

Nominated Principal Investigator: Ajitha Thanabalasuriar*, Assistant Professor, Pharmacology and Therapeutics, McGill University*

Principal Investigator(s): Erika D Penz

In this work we systematically understand how e-cig vape affects lung immunity. Moving from a mouse model to human studies, we monitor changes to granulocytic population caused by flavoured versus unflavoured e-cig exposure. We will translate the knowledge from this study to educate at-risk youth groups to prevent new e-cig users. Through the understanding of e-cig mediated immune disruption we can better inform the public of the adverse effects of vaping. This study develops an in depth understanding of how e-cig mediated disease develops, from bench to bedside. Our ultimate goal is to prevent a similar disease epidemic we experienced with cigarette smoke, with e-cig use.

Poster # 13

Acute Airway Inflammation Induced by Vaping

Nominated Principal Investigator: Harissios Vliagoftis*, Professor, Department of Medicine, University of Alberta*

Principal Investigator(s): Heather M Sharpe

Co-investigator(s): Paige Lacy, Irvin Mayers, Michael K Stickland, Eric Y Wong

We aim to identify acute and chronic inflammatory changes induced by vaping. For this we will study the outcomes before and after an acute vaping challenge or a sham challenge. The outcomes we will study are changes in activation status of inflammatory and immune cells by flow cytometry; the presence of inflammatory mediators in blood and induced sputum; and functional assays for neutrophils and monocytes/macrophages. We have recruited 8 subjects, 4 naïve individuals and 4 habitual vapers. Data from these subjects indicate changes in the functional status of inflammatory cells after vaping. Specifically, our data show that the potential of peripheral blood monocytes and neutrophils to produce superoxide decreased after a vaping session compared to a sham session, while there is a trend for increased phagocytosis under the same circumstances. In sputum we see an increase in monocyte subsets after the vaping session. We plan to compare baseline inflammatory indices between habitual vapers and naïve individuals to understand the chronic inflammatory changes induced by vaping. These data indicate that even one short term exposure to vaping solutions alters the function of immune cells in blood and in the airways. Further studies are needed to better define these alterations.

Poster # 14

Respiratory Effects of Nicotine and THC E-Cigarettes

Nominated Principal Investigator: Robert Schwartz*, Professor, Dalla Lana School of Public Health, University of Toronto*

Principal Investigator(s): Peter Glazier, Chung-Wai Chow

Co-investigator(s): Michael O Chaiton, Miranda A Kirby, Micheal C McInnis, Hui Peng, Clodagh M Ryan

The key question addressed by this study is: “Do nicotine and cannabis ECIG users develop “ground-glass opacities” (GGOs), other lung abnormalities, and/or airway function problems as a result of their ECIG use?” With the catalyst grant we will be the first to combine e-liquid analyses with CT scans and pulmonary function tests (PFTs) with oscillometry (OCS) to compare nicotine, cannabis vapers and non-vapers to answer this question. We will recruit people (aged 18 to 45) who have been using e-cigarettes for at least two years, analyze their e-cigarette liquids and conduct CT scans and PFTs including OSC. The budget allows for 36 participants: 12 nicotine vapers, 12 cannabis vapers and 12 non-vapers. Both participant recruitment and clinical testing have been delayed, on and off, due to COVID-19. We began participant recruitment in Summer 2021 through social media and past study participant panels. To date, 11 nicotine vapers, 11 THC vapers and 12 non-vapers have completed PFTs (including OSC) and 10 nicotine vapers, 7 THC vapers and 10 non-vapers have also completed CT scans. By March, we will have filled our quota of 36 participants, analyzed the data and will present findings.

Poster # 15

Cannabis and Nicotine Vaping During Pregnancy and Postpartum

Nominated Principal Investigator: Lorraine Greaves*, Senior Investigator, Centre of Excellence for Women's Health, University of British Columbia*

Principal Investigator(s): Nancy Poole

Co-investigator(s): Jocelynn L Cook

Little is known about vaping cannabis and/or nicotine during pregnancy and postpartum. We conducted 111 surveys and 22 semi-structured interviews with women who vape(d) nicotine and/or cannabis during pregnancy/postpartum to learn about their experiences with and motivations for vaping, and their information needs. Women were recruited via social media and organizational websites. Survey data were analyzed using SPSS and interview transcripts using NVivo. 63% of respondents were currently pregnant, 51% vaped nicotine, 27.9% vaped cannabis, and 20.7% vaped both. The most frequent reasons for vaping cannabis were to manage insomnia, depression and anxiety, headaches/migraines, and lack of appetite, and to avoid pharmacological alternatives perceived as more harmful. Vaping nicotine was primarily undertaken to reduce or quit smoking. For women who consulted health care providers about vaping, the most frequent reasons were to understand possible harms during pregnancy, and/or to fetal or child health. The interviews highlighted: women's agency in information seeking and in risk assessment; the reasons for vaping; and experiences of, and responses to, stigma. Participants made vaping related decisions after considerable input and were generally critical assessors of information. Project findings have been translated into information sheets for women and healthcare providers, journal articles and conference presentations.

Poster # 16

Vaping and Asthma – A Study on Short and Long-term Health Effects of Vaping Among Ontario Youths and Young Adults with Asthma Identified in Health Administrative Data and Linked to the Canadian Community Health Survey

Nominated Principal Investigator: Teresa To*, Professor, The Hospital for Sick Children, University of Toronto*

Co-investigator(s): Jennifer MacKinnon, Cornelia M Borkhoff, Chung-Wai Chow, Theo Moraes, Robert M Schwartz, Nicholas Vozoris

While vaping is thought to be a safer alternative to smoking, emerging research and recent related hospitalizations of youth suggests that e-cigarette (EC) use may have long-term health effects and increased burden on healthcare systems. We conducted a cohort study linking 6,700 Ontario participants in the Canadian Community Health Survey (CCHS) to population health data to determine whether youth and young adults aged 15-30 years who were current EC users had differing patterns of health services use (HSU) compared to non-users. Negative binomial regression was used to estimate the rate ratios (RR) and 95% confidence intervals (CI) of EC use and all-cause and respiratory-disease-specific HSU (hospitalization, emergency department visit). The RR of EC use and all-cause HSU was 1.46 (95%CI: 1.24-1.72). EC users who currently smoked had nearly a two-fold increased all-cause HSU rate compared to non-users who never smoked (RR=1.74; 95%CI: 1.43-2.14). Female cigarette and EC smokers and non-EC smokers had significantly increased all-cause HSU (RR=1.62; 95%CI:1.19-2.21 and RR=1.29; 95%CI: 1.12-1.48, respectively). In summary, concurrent EC use and cigarette smoking are associated

with a higher rate of all-cause HSU. Our findings suggest that EC use may be an epidemiological biomarker for youth and young adults with increased health morbidity.

Poster # 17

Vaping and Health Outcomes, and Use of the Health Care System Among Parents and Adolescents in Manitoba

Nominated Principal Investigator: Tracie Afifi*, Professor, Department of Community Health Sciences, University of Manitoba*

Co-investigator(s): Lil E Tonmyr, Marni D Brownell, Harriet L Macmillan, Nathan C Nickel, Jitender Sareen

Adolescence is an important developmental time when substance use often begins. More recently, electronic vaping products (such as e-cigarettes, e-cigars, vape pipes and vaping pens) have become the most common nicotine product in the US among youth. Less is known about vaping in Canada. However, research from our group found that 27.8% of adolescents from a Manitoba community sample have used a vaping product in the last 30 days. Information is now only emerging on the impacts of vaping on health with most of this research focused on adults. The goals of the current research are: 1) to understand the course of vaping (i.e., never vaping, quitting, starting later, or continuous vaping) among adolescents and what factors may be related to the course; 2) to understand if vaping is associated with using other substances; 3) to determine if vaping is used as a way to cope with problems; and 4) to understand the impact vaping has on health conditions and use of the health care system among male and female adolescents and young adults. Understanding differences between males and females will be a main focus of each research aims.

Poster # 18

A Machine Learning Approach to Identify Drivers of e-cigarette Dependence

Nominated Principal Investigator: Michael Chaiton*, Associate Professor, CAMH, University of Toronto*

Co-investigator(s): Susan J Bondy, Adam G Cole, Tara E Elton-Marshall, Hayley A Hamilton, Sean Hill, Scott Leatherdale, Nikolaos Mitsakakis, Robert M Schwartz, Wei Wang

Understanding person-level drivers of current e-cigarette use (vaping) is crucial to guide tobacco policy, but prior studies have not fully identified these drivers due to the reliance on cross-sectional data, small sample sizes in many studies, lack of generalizability, and limitations of traditional data analyses. We address this gap in knowledge by using machine learning methods including methods capable of learning from multiple data sources. Person-level and survey-level characteristics were explored as candidate predictors from multiple datasets. The location of last vape purchase, number of days a pod lasts and the frequency of nicotine use while vaping were the most important predictors for vaping dependence among daily vapers while race, and sexual orientation were the most important predictors of increased dependency in non-daily vapers. A complete meta-analysis of predictors from machine learning and non-machine learning based studies was conducted.

Poster # 19

Genetic Impact on Youth Vaping: Extending Known Genetic Risk Factors in Smoking and Tobacco-Related Illnesses to Vaping

Nominated Principal Investigator: Meghan Chenoweth*, Scientist, Centre for Addiction and Mental Health, University of Toronto*

Principal Investigator(s): Rachel F Tyndale

Co-investigator(s): Mark J Eisenberg, Amy J Porath, David G Hammond, Jennifer L O'Loughlin, Marie-Pierre Sylvestre

The prevalence of vaping among youth has dramatically increased in recent years. Adolescents who smoke cigarettes are more likely to start vaping, and the reverse is also true: vaping can lead to smoking. In former smokers, vaping increases the risk for relapse back to smoking. While some young people report vaping to help them quit smoking, most continue to smoke resulting in dual use. Thus, vaping may prolong smoking and increase harms in youth who would have otherwise quit. Genetic variation is known to influence cigarette smoking behaviours. For example, people with gene variants that increase the rate at which nicotine is broken down smoke more cigarettes and are less likely to quit. In youth from Canada and England, we are studying whether having a genetic predisposition to breaking down nicotine more quickly increases the risk for transitioning from smoking to dual use. We are also examining whether this genetic predisposition increases the risk for relapsing back to smoking in former smokers who initiate vaping. As secondary goals of this project, we are also examining, for example, whether genes that alter the response to nicotine and cannabis in the brain influence the risk for vaping nicotine and cannabinoid extracts.

Poster # 20

Rewarding Effects of "JUUL" e-cigarette Vapour: Impact of Age and Neural Correlates

Nominated Principal Investigator: Jibran Khokhar*, Canada Research Chair in Translational Neuropsychopharmacology, Department of Anatomy and Cell Biology, Schulich School of Medicine and Dentistry, Western University*

Co-investigator(s): Amy Estill

The aim of the following research is to assess developmental and sex differences in nicotine vapour-associated reward and withdrawal. We also explored the effects of sex and age on nicotine vapour pharmacokinetics and brain functional and structural connectivity. Adult and adolescent rats of both sexes were exposed to either nicotine (JUUL, 5% nicotine) or vehicle vapour for 10 minutes and then assessed for either conditioned place preference or withdrawal. Rats were assessed for brain imaging 2 weeks after last exposure. Nicotine pharmacokinetics were assessed via blood draws after a single 10-minute exposure in a separate group of rats. All groups (except adolescent females) showed significant increases in place preference for the nicotine-paired side, with adolescent males displaying significantly higher preference at lower doses than adult males. Moreover, only male adult and adolescent rats showing significant precipitated nicotine withdrawal. However, contrasting with these findings, female adolescent and adult rats had higher levels of nicotine and metabolites in the brain and plasma. Lastly, network-based statistics showed decreased functional connectivity (across multiple nodes and edges) in rats exposed to nicotine (with sex and age as co-variates). Further analysis showed that there was a significant effect of sex on both functional connectivity with females showing greater reductions in connectivity.

Poster # 21

Health Effects of Vaping among Youth: Evidence from Quasi-Experimental Analyses

Nominated Principal Investigator: Hai Nguyen*, Associate Professor, School of Pharmacy, Memorial University of Newfoundland*

Co-investigator(s): David S Diamond, Stephen E Bornstein, Leigh Anne Newhook, Brenda J Wilson

Several studies have shown that vaping is associated with a number of adverse mental health outcomes. However, these studies are unable to establish the direction of this relationship. That is, it is not clear whether vaping causes adverse mental health, or people with mental health issues are more likely to vape. In this study, we first estimated the impacts of minimum legal age (MLA) laws for e-cigarettes on youths' mental health (mood and anxiety disorders) and their e-cigarette use. Next, we combined these estimates to generate the causal effect of vaping on mental health. We used data from the nationally representative Canadian Community Health Surveys 2008-2019 and Canadian Student Tobacco Alcohol and Drugs Surveys 2008-2019. We found that MLA laws for vaping reduced the risks of mood and anxiety disorders. These reductions are likely driven by lower cannabis and illicit drug use, and improved peer relationships at schools. Combined with previous evidence that the MLA law also reduced youth e-cigarette use, our findings suggest that youth e-cigarette use leads to higher risks of mood and anxiety disorders. Our study draws attention to e-cigarettes as a contributor to the growing mental health crisis facing youths and heightens the need to address rising youth e-cigarette use. It also highlights the MLA law's benefits of reducing these risks by lowering youths' cannabis and illicit drug use and enhancing their feeling of being part of schools.

Poster # 22

Vaping in At-risk Populations: Effects on Mental and Physical Health (VAPE) Study

Nominated Principal Investigator: Zainab Samaan*, Professor, Department of Psychiatry and Behavioural Neurosciences, McMaster University, McMaster*

Principal Investigator(s): Leonora J Regenstreif

Co-investigator(s): Tea Rosic, Claire de Oliveira, Alessia D'Elia, David C Marsh, Parameswaran K Nair, Nitika Sanger, Lehana Thabane

Vaping has been increasing in popularity among young people and people with substance use with limited knowledge about safety and long-term health effects. The pattern, motivation and types of vaping used in the population are largely unknown especially in patients with opioid addiction. Our team investigated the motivation and types of products used in vaping and the individuals' perception of harms and benefit to provide an opportunity to understanding people's needs, provide appropriate information to aid informed decision making. We also investigated health effects of vaping in patients with opioid addiction using longitudinal data from linked health records. We provide suggestions for screening and education of patients, healthcare providers and other stake holders on vaping, it's prevalence in patients with addiction and its possible consequences.

Poster # 23

Cannabis Vaping Experiences and Decisions Among Youth and Young Adults in Manitoba (The CaVED Project)

Nominated Principal Investigator: Lynda Balneaves*, Associate Professor, College of Nursing, University of Manitoba*

Principal Investigator(s): Shelley Turner, Roberta L Woodgate

Co-investigator(s): David G Hammond, Nathan C Nickel

An unprecedented increase in vaping among adolescents and young adults (AYAs) has occurred in Canada, raising concerns about the short and long-term health effects. With the recent legalization of recreational cannabis, AYAs may be also consuming cannabis through vaping. The aim of this study was to improve understanding of cannabis vaping behaviour among AYAs living in Manitoba. In a survey of 1,738 AYAs, 49.1% reported vaping cannabis within the past year, with 18% vaping at least once a day and 25% vaping 1-4 times a week. Half of AYAs who vaped cannabis were utilizing THC only or high THC low CBD products. Compared to other ways of consuming cannabis, vaping was seen to be easier to hide and get high from, as well as enable cannabis use where smoking was not allowed. AYAs who chose not to vape cited lack of interest, concerns about health effects, and preference for the way they currently consume cannabis. Across all AYAs, about half reported not receiving information about how to use cannabis safely, as well as the potential physical and social harms of cannabis. These findings provide direction for future national research on cannabis vaping among AYAs and the development of tailored education interventions.

Poster # 24

Teens Talk Vaping: A Qualitative Integrated Knowledge Translation Study to Co-produce Vaping Research and Educational Tools with Teens

Nominated Principal Investigator: Jason Gilliland*, Professor, Department of Geography and Environment, Western University*

Principal Investigator(s): Stephanie Coen

Co-investigator(s): Anita G Cramp, Christopher Mackie, April Price, Terry Spencer, Shauna M Burke, Eugenia Canas, Rebecca J Haines-Saah

Increasing evidence of harms associated with vaping has led the Government of Canada to identify youth vaping as a major public health concern. While medical research has helped to discover how vaping is linked to these harms, more qualitative health research is needed to understand how and why youth vape. There is an urgent need to understand young peoples' firsthand experiences with vaping to ensure that research and educational resources resonate with them. This participatory project co-produced research about teen vaping with teen co-researchers. After receiving comprehensive training by our team of health research experts, our teen team members conducted online focus groups with teens across Canada to elicit information about how and why youth vape. Our project findings were used to inform the development of evidence-based vaping education materials by-youth-for-youth, as well as for decision-makers and parents. Our study aimed to make a novel contribution to vaping research and education in Canada, where youth voices are largely absent. By engaging teens as co-researchers, we are helping to ensure that future vaping research and educational tools are grounded in evidence that accounts for their diverse experiences and contexts of vaping.

Poster # 25

An Experimental Investigation of the Demand for Electronic Nicotine Delivery Systems (ENDS)

Nominated Principal Investigator: G. Emmanuel Guindon**,** *Associate Professor, Department of Health Research Methods, Evidence, and Impact, McMaster University*

Principal Investigator(s): Neil J Buckley, Emmanouil Mentzakis

Co-investigator(s): Michael O Chaiton, Paul Rodriguez-Lesmes, Ce Shang, Arthur Sweetman, Cynthia Callard, Les Hagan

Our project aimed to examine, using experimental approaches, the demand for electronic nicotine delivery systems (ENDS) such as vaping and heated products. Few important ENDS policy changes had been implemented in Canada and for the relatively few that had been implemented, changes occurred recently which makes it difficult to use standard empirical approaches. Specifically, we examined the effects of, and trade-offs between 1) health warning on devices and combustible cigarettes; 2) plain packaging of vaping products; 3) maximum nicotine level allowable in vaping products, and 4) prices. Although our focus was on the demand for popular vaping and heated products, we included combustible cigarettes as an alternative in our study design because of the importance of interactions between ENDS and combustible cigarettes. To keep our experiment as realistic as possible, we focused on the most popular brands for each product category (JUUL, vaping; IQOS, heated; and du Maurier, cigarettes). We examined ENDS use intentions and risk perceptions among approximately 1800 young nonusers (16 to 29 years) residing in Alberta, Ontario and Québec.

Poster # 26

The Impact of Vaping Policies on the e-cigarette Product Market and Youth Vaping

Nominated Principal Investigator: David Hammond*, Professor, School of Public Health Sciences, University of Waterloo,*

Co-investigator(s): Katherine East, Christian Boudreau, Geoffrey T Fong, Richard J O'Connor

The e-cigarette market has rapidly evolved in Canada. The primary aims of his project were to: (1) provide a ‘snapshot’ of the e-cigarette retail market in Canada in 2021 and (2) examine differences in product between provinces with different policies on flavours and nicotine concentration. A retail scan was conducted between January and May 2021, and identified a total of 37,655 unique e-liquids from online retailers. A telephone scan was also conducted with 230 ‘brick-and-mortar’ vape stores and 230 gas/convenience stores across all provinces to compare the profile of products identified in the online scan with products available in stores across the country. The maximum e-liquid concentration identified was 60mg/mL, while the most common flavour identified was fruit. Provinces that fully restricted the sale of vaping products with nicotine concentrations over 20mg/mL fully offered a lower proportion of e-liquids over 20mg/mL both online and in brick-and-mortar stores, thus suggesting that full restrictions have reduced the availability of higher-strength e-liquids at the provincial level. Patterns were less clear for full flavour bans. The findings have implications for understanding consumer patterns of use, as well as compliance with federal and provincial vaping regulations.

Poster # 27

Geospatial Analyses of Vape Retailer Accessibility: Examining Socioeconomic and Environmental Determinants

Nominated Principal Investigator: Jamie Seabrook*, Professor, Food and Nutritional Sciences, Brescia University College*

Principal Investigator(s): Jason A Gilliland

Co-investigator(s): Christopher Mackie, Kelly K Anderson, Gina Martin, Jacob J Shelley

There is an urgent need to develop tools and measures to understand predictors of youth vaping and to guide policy and programs aimed at reducing harms from youth vaping. With the changing regulatory landscape concerning e-cigarette sales and advertising across Canada, it is imperative that we monitor the effects of vape availability from retail access. We know little about the association between environmental factors and youth vaping. Despite pandemic-related setbacks, our team has created a database for all Ontario that identifies and maps the locations of every vape retailer utilizing geospatial analysis techniques within a geographic information system. We created metrics such as "proximity to" and "density of" vaping retailers in relation to school locations and neighbourhood socioeconomic status across the province and identified socioeconomic inequities regarding the distribution of this environmental burden. A database of outcome measures will be made available to other researchers and public health professionals. This dataset will support the linking of other datasets to conduct further research into the determinants of youth vaping and related health outcomes, as well as the impacts of future regulatory changes. The outcomes of this research may inform the development of prevention and awareness campaigns, and regulations restricting youth vaping.

CIHR IRSC

Canadian Institutes of Health Research | Instituts de recherche en santé du Canada

CIHR IRSC | Canadian Institutes of Health Research | Instituts de recherche en santé du Canada

Canadian Cancer Society | Société canadienne du cancer