

Research and Practice Virtual Showcase 2020

Tuesday, October 27 2020

Infectious and Non-Communicable Diseases

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Name: Amy Chang

Program: MPH Epidemiology

Project Title: Examining prevalence of cancer risk factors across Ontario for the Ontario Cancer Profiles tool

Research or Practice: Practice

Key Words: Non-Communicable Disease, Prevention, Cancer Risk Factors

Abstract: The Ontario Cancer Profiles is an interactive dashboard for the public containing population-level cancer statistics created by Ontario Health (Cancer Care Ontario). The tool contains data on cancer burden, cancer screening measures, and cancer risk factors by Local Health Integration Network (LHIN) and Public Health Unit (PHU). It can be used for health system planning, measuring health systems performance, monitoring the impact of interventions, and to help identify new areas of research. There were 9 new modifiable cancer risk factors proposed to be included in future updates of the dashboard. The proposed risk factors include: access to care, active transportation, binge drinking, alcohol abstinence, inadequate fruit consumption, inadequate vegetable consumption, sedentary behavior, secondhand smoke exposure, and sun safety. My practicum consisted of two main objectives: to conduct a literature search on the association between the proposed risk factors and cancer and to determine the prevalence of exposure of the identified risk factors in Ontario using 2015 to 2017 CCHS data. I performed a literature search to examine current evidence linking each proposed risk factor with cancer risk to determine the inclusion or exclusion of the indicator in the analysis. An analysis was performed with the selected variables in CCHS, each indicator was age-standardized, and both standardized and crude ratios of individuals engaging in selected indicator activities were calculated. The results were examined for reliability using the produced coefficient of variation values. The estimates for each risk indicators allowed for the identification of target population that may be at higher risk of developing cancer due to greater exposure to the risk factors. They also serve as useful predictors for areas of improvement in regions with a high prevalence, such as healthy living within the community, and a guide to implementing preventative measures, screening, or treatment plans that may have been lacking.

Name: Mohamed Djebli

Program: MPH Epidemiology

Project Title: Comparing risk factors for severe outcomes of influenza and respiratory syncytial virus using laboratory-confirmed testing

Research or Practice: Research

Key Words: Infectious and Communicable Disease, Prevention

Abstract:

Objective: Influenza and respiratory syncytial virus (RSV) are significant contributors to morbidity and mortality, especially in young children, older adults, and those with underlying health conditions. The objective of this study was to use population-based health administrative data and laboratory-confirmed test results from Ontario to estimate risk factors for severe outcomes related to influenza and RSV.

Design: We conducted a case-control study examining Ontario residents who had laboratory-confirmed influenza or RSV, and who were hospitalized in the 2014-15 to 2017-18 respiratory virus seasons. This data was linked to hospital discharge abstract data to examine risk factors for ICU admission and mortality from influenza and RSV.

Results: 11,871 and 4,964 individuals were identified as hospitalized with a positive influenza or RSV test, respectively. Cancer and dementia/frailty were associated with increased odds of mortality from influenza and RSV. Rural residency was associated with increased odds of ICU and death from RSV. Influenza vaccination was associated with decreased odds of death only for influenza.

Conclusion/Implications: We used laboratory data and hospital discharge abstract data to identify key risk factors for RSV and influenza. Some of these factors are unique to each virus, meaning these results could help distinguish risk groups for these similarly presenting viruses. The shared risk factors are also noteworthy and are worth investigating in respiratory viruses beyond influenza and RSV. In the face of COVID-19, understanding general risk factors for respiratory viruses could be crucial when deciding target groups for vaccines and other interventions. Additionally, these results can inform and serve as a comparison to other methods of risk factor analysis using data sources other than laboratory data.

Name: Jona Gjevori

Program: MPH Epidemiology

Project Title: Predicting Methicillin-Resistant Staphylococcus aureus (MRSA) Bloodstream Infection Incidence Rates using Canadian Nosocomial Infection Surveillance Program (CNISP)

Key Words: Infectious and Communicable Disease, Prevention

Abstract: Methicillin-Resistant Staphylococcus aureus (MRSA) is among the most prevalent nosocomial pathogens globally, causing significant morbidity, mortality, and healthcare costs. MRSA bloodstream infection (BSI) incidence rates in Canadian hospitals have significantly risen by almost 60% and have a mortality of over 20% upon Intensive Care Unit admission. MRSA is believed to be spread through healthcare workers; thus, high hand hygiene compliancy in addition to environmental cleaning are the cornerstone countermeasures to disrupting its transmission. The Public Health Agency of Canada (PHAC), in collaboration with the Canadian Nosocomial Infection Surveillance Program (CNISP), conducts national, sentinel surveillance on healthcare-associated infections like MRSA. As a Student Epidemiologist, I developed a research proposal detailing two study objectives: 1) develop a regression model to predict all incident MRSA BSI rates among acute-care hospitals in Canada using CNISP MRSA BSI incident cases from 2000 to 2019, and 2) create a compartmental (Susceptible-Infected-Recovered-Deceased) model to determine the impact of various Infection Prevention and Control (IPC) measures on the risk of healthcare-associated MRSA BSI transmission specifically. This study hopes to demonstrate that proper IPC compliance is associated with lower incident MRSA BSI rates with the goal being to produce a manuscript draft by 2021. MRSA poses a serious threat to patient safety globally and is becoming a growing national public health concern in Canada; determining which IPC strategy is most effective at disrupting MRSA transmission is essential to reducing incidence and mortality rates.

Name: Mackenzie Hamilton

Program: MPH Epidemiology

Project Title: Validating International Classification of Disease 10th revision algorithms for identifying influenza and respiratory syncytial virus hospitalizations

Research or Practice: Research

Key Words: Infectious and Communicable Disease, Validation Study

Abstract:

Objective: Routinely collected health administrative data can be used to efficiently assess disease burden in large populations, but it is important to evaluate the validity of these data. The objective of this study was to develop and validate International Classification of Disease 10th revision (ICD -10) algorithms that identify laboratory-confirmed influenza or laboratory-confirmed respiratory syncytial virus (RSV) hospitalizations using population-based health administrative data from Ontario, Canada.

Study Design and Setting: Influenza and RSV laboratory data from the 2014-15 through to 2017-18 respiratory virus seasons were obtained from the Ontario Laboratories Information System (OLIS) and were linked to hospital discharge abstract data to generate influenza and RSV reference cohorts. These reference cohorts were used to assess the sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of the ICD-10 algorithms. To minimize misclassification in future studies, we prioritized specificity and PPV in selecting top-performing algorithms.

Results: 83,638 and 61,117 hospitalized patients were included in the influenza and RSV reference cohorts, respectively. The best influenza algorithm had a sensitivity of 73% (95% CI 72% to 74%), specificity of 99% (95% CI 99% to 99%), PPV of 94% (95% CI 94% to 95%), and NPV of 94% (95% CI 94% to 95%). The best RSV algorithm had a sensitivity of 69% (95% CI 68% to 70%), specificity of 99% (95% CI 99% to 99%), PPV of 91% (95% CI 90% to 91%) and NPV of 97% (95% CI 97% to 97%).

Conclusion: We identified two highly specific algorithms that best ascertain patients hospitalized with influenza or RSV. These algorithms may be applied to hospitalized patients if data on laboratory tests are not available, and will thereby improve the power of future epidemiologic studies of influenza, RSV, and potentially other severe acute respiratory infections.

Name: Fatima Khadadah

Program: MScCH Health Practitioner Teacher Education

Project Title: The effects of non-pharmaceutical interventions on SARS-CoV-2 transmission in different socioeconomic populations in Kuwait: A modelling study

Research or Practice: Research

Key Words: Global Health, Infectious and Communicable Disease, Marginalized Populations

Abstract:

Background: Aggressive non-pharmaceutical interventions (NPIs) may reduce transmission of SARS-CoV2. The extent to which these interventions are successful in stopping the spread have not been characterized in countries with distinct socioeconomic groups. We compared the effects of a partial lockdown on disease transmission among Kuwaitis (P1) and non-Kuwaitis (P2) living in Kuwait.

Methods: We fit a metapopulation Susceptible-Exposed-Infectious-Recovered (SEIR) model to reported cases stratified by two groups to estimate the impact of a lockdown on the effective reproduction number (R_e). We estimated the basic reproduction number (R_0) for the transmission in each group and simulated the potential trajectories of an outbreak from the first recorded case of community transmission until 12 days after the lockdown. We estimated R_e values of both groups before and after the lockdown, simulated the effect of these values on epidemic curves and explored a range of cross-transmission scenarios.

Results: We estimate R_0 at 1.06 (95% CI: 1.05-1.28) for P1 and 1.83 (1.58-2.33) for P2. On March 22nd, R_e for P1 and P2 are estimated at 1.13 (1.07-1.17) and 1.38 (1.25-1.63) respectively. After the curfew had taken effect, R_e for P1 dropped modestly to 1.04 (1.02-1.06) but almost doubled for P2 to 2.47 (1.98-3.45). Our simulated epidemic trajectories show that the partial curfew measure modestly reduced and delayed the height of the peak in P1, yet significantly elevated and hastened the peak in P2. Modest cross-transmission from P2 to P1 elevated the height of the peak in P1 and brought it forward in time closer to the peak of P2.

Conclusion: Our results demonstrate that a lockdown can reduce SARS-CoV2 transmission in one subpopulation but accelerate it in another. At the population level, the consequences of lockdowns may vary across the socioeconomic spectrum. Any public health intervention needs to be sensitive to disparities within populations.

Name: Abhinav Thakral

Program: MPH Epidemiology

Project Title: Comparison of Two Genome-Wide Association Studies of Heart Rate Response to Exercise from the UK Biobank

Research or Practice: Research

Key Words: Biostatistics, Non-Communicable Disease, Prevention, Genetics, GWAS, Polygenic Scores

Abstract: The short-term changes in heart rate (HR) during and after exercise are important physiologic traits. Variations in these traits have been shown to be associated with mortality from cardiovascular causes. Further, these variations have been shown to be heritable. From a public health perspective, knowledge of genetics of these heart rate traits is important because it could help in targeting population health interventions towards those at greater risk of adverse cardiovascular outcomes. Therefore, we conducted a systematic review of genome-wide association studies with the aim of identifying genetic variants associated with these heart-rate traits. Another aim was to compare Polygenic Risk Scores (PRS) for the heart-rate traits from these studies. PRS are summary estimates of risk for a particular disease for an individual based on their genetic makeup. These PRS could potentially identify individuals at higher risk of the disease.

The systematic search yielded two studies (Verweij et al. and Ramirez et al.) that met our inclusion criteria. Both were conducted on the UK Biobank population. The two studies identified several genetic variants, many of which were common and some that were mutually exclusive between the studies. However, there was a good agreement of Polygenic Risk Scores (PRS) from the studies. These PRS could potentially identify individuals at higher risk of adverse cardiovascular outcomes. However, the PRS have not been validated in clinical settings. Further, both studies had an under-representation of individuals of non-European ancestry. Future studies would need to help address this gap and to validate PRS in clinical settings.

Name: Rochelle White

Program: MPH Epidemiology

Project Title: Cross-sectional analysis of the association between rectal bacterial STIs and anal HPV among gay, bisexual, and other men who have sex with men

Research or Practice: Research

Key Words: Infectious and Communicable Disease, Prevention

Abstract: Majority of cervical and anal cancers are caused by HPV. Among women, chlamydia (CT) and gonorrhea (NG) “play a role as co-factors in HPV-mediated cervical carcinogenesis”.¹ Bacteria including CT and NG cause inflammation of the cervix which can increase susceptibility to HPV and increase persistence of already-existing HPV. A similar process may occur in the anal canal as the morphology of the anal canal is similar to the cervix. The natural history of HPV infection in the anal canal is analogous to cervical infection.

Our goal was to explore the association between rectal CT and NG infection with anal HPV infection among gay, bisexual, and other men who have sex with men. We also aimed to determine whether this association was different among HPV-vaccinated and unvaccinated men.

Engage-HPV is a prevalence study of oral and anal HPV infection. Men aged 16-30 were recruited in Vancouver, Montreal, and Toronto. Participants completed a detailed sexual health questionnaire and provided self-collected anal swabs used for HPV detection.

Overall, 94.23% of participants that tested positive for rectal CT/NG also tested positive for anal HPV. There is a significant association between rectal CT/NG and anal HPV, after controlling for recent sexual behavior. This finding supports the co-factor hypothesis. Men that have a rectal CT/NG infection are 3.4 times more likely to have an anal HPV infection compared to those who do not have a rectal CT/NG infection. After stratifying by vaccination status, we found that all vaccinated men with CT/NG were coinfecting with a non-vaccine preventable type of HPV. Therefore, vaccination alone is not sufficient to prevent HPV infection. Anal HPV screening is not available, but screening is available for rectal CT and NG. Therefore, clinicians should encourage testing and treatment for rectal CT and NG as a means of preventing HPV-mediated anal carcinogenesis.

Name: Steven Winkelman

Program: MPH Social and Behavioural Health Science (Health Promotion)

Project Title: Challenging the HIV Epidemic in Ontario Through PrEP and HIV Testing: An OHTN Practicum in Two Parts

Research or Practice: Practice

Key Words: Infectious and Communicable Disease, Prevention, HIV

Abstract: The Ontario HIV Treatment Network (OHTN) is a non-profit network which collaborates with health clinics, AIDS service and community organizations, and policy leaders in order to improve the health and wellbeing of people living with and at risk of HIV. I joined the OHTN as a member of the Collective Impact team, with a focus on examining the barriers and facilitators to Pre-Exposure Prophylaxis (PrEP) uptake in Ontario. PrEP is a once-daily pill which is highly effective in preventing HIV infections for HIV-negative people, however usage remains relatively low in Ontario. In this role, I liaised with the Knowledge Synthesis team at OHTN to collect, analyse, and synthesize recent scientific literature on Pre and Post-exposure prophylaxis (PEP) in order to create a comprehensive annotated bibliography on PrEP research. Key findings were drawn from the research to identify potential next steps to increase PrEP use for priority populations in Ontario. Findings from the annotated bibliography were presented to OHTN staff, and have been used to assist in the development of two PrEP study proposals; 1) a cisgender and transgender women-focused PrEP education package and HIV risk screening tool, and 2) a pharmacist-led PrEP delivery pilot.

I also worked with the Testing and Clinical Initiatives team at the OHTN, to aid in the implementation and evaluation of two HIV-testing projects: the GetaTest pharmacy-based HIV-testing study, and the GetaKit HIV self-testing pilot program. In this role I drafted health communication materials; analysed survey data and drafted project reports for stakeholders; and provided perspectives on the HIV-care continuum, particularly on PrEP initiation, adherence, and efficacy. My work with the OHTN was important to public health because it sought to expand access to HIV testing and prevention services for priority populations in Ontario, including men who have sex with men, and cis and trans women

Name: Jessica Wong

Program: PhD Epidemiology

Project Title: The effect of low back pain on health care utilization and costs: A population-based matched cohort study on the health system burden of low back pain

Research or Practice: Research

Key Words: Chronic Disease, Non-Communicable Disease

Abstract:

Objective: We assessed the effect of self-reported low back pain (LBP) on health care utilization and costs in a population-based sample of Ontario adults.

Methods: We conducted a population-based matched cohort study of Ontarian respondents aged ≥ 18 years of Canadian Community Health Survey (CCHS) from 2003-2012. CCHS data were individually linked to health administrative data to measure health care utilization and costs up to 2018. We propensity-score matched (hardmatched on sex) adults with self-reported LBP to those without LBP, accounting for sociodemographics, health-related, and behavioural factors. We evaluated LBP-specific and all-cause health care utilization and costs from healthcare payer perspective adjusted to 2018 Canadian dollars. Poisson and linear (log-transformed) models were used to assess healthcare utilization rates and costs.

Results: After propensity-score matching, we identified 36,806 pairs (21,054 for women, 15,752 for men) of CCHS respondents with and without LBP (mean age 51 years; SD=18). Compared to propensity-score matched adults without LBP, adults with LBP had two times the rate of LBP-specific visits (women: rate ratio [RR] 2.06, 95% CI 1.88-2.25; men: RR 2.32, 95% CI 2.04-2.64), 1.1 times the rate of all-cause physician visits (women: RR 1.12, 95% CI 1.09-1.16; men: RR 1.10, 95% CI 1.05-1.14), and 1.2 times the costs (women: 1.21, 95% CI 1.16-1.27; men: 1.16, 95% CI 1.09-1.23). Incremental annual per-person costs were higher in adults with LBP versus those without (women: \$395, 95% CI \$281-\$509; men: \$196, 95% CI \$94-\$300), corresponding to \$532 million for women and \$227 million CAD for men annually in Ontario.

Public health impact/implications: Adults with LBP had considerably higher health care utilization and costs compared to adults without LBP. These findings provide the most recent, comprehensive, and high-quality estimates of the health system burden of LBP to inform healthcare policy and decision-making. New strategies to reduce the substantial burden of LBP are warranted.