EPIDEMIOLOGY COUNCIL NEWSLETTER – AUGUST 2020

ISPAH | Epidemiology Council

From the Co-Chairs

Hi members,

Welcome to the third newsletter of the ISPAH Epidemiology Council.

We hope everyone is staying safe in these unusual times. In this newsletter we showcase some of the COVID-19 related work a couple of our members have been doing, and we profile one of our members, Jakob Tarp. And in our continuing 'Primer' series we have a piece from Dr Ghazaleh Dashti about causal mediation analysis.

Brigid Lynch (co-Chair) and Suzanne Dixon-Suen (Secretary), are both stepping down at our upcoming AGM. This means that the Epidemiology Council is seeking nominations for the Co-Chair and Secretary positions. This is a great opportunity for a leadership role in one of ISPAH's Councils. The workload is not onerous, and these roles will give you the chance to develop your own projects and activities to influence and support the field of physical activity epidemiology, and also to expand your networks. Please get in touch with Terry if you would like more information about what these roles would involve.

Finally, we are planning an AGM around the time of the ISPAH Virtual Congress and will be in touch with more details about that soon. We hope you can join us to hear more about the progress of our current and planned projects!

With best wishes

Brigid and Terry

Co-Chairs Epidemiology Council

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Epidemiologists in action

Without a doubt, 2020 has been the Year of the Epidemiologist. The general public no longer think we study skin …. they now think we're all infectious disease experts!

Two of our Epidemiology Council members have been involved in the COVID-19 responses in their countries (see their stories, below). We'd love to hear from any other Epi Council members who have been involved in the COVID-19 response; email any updates to co-Chair Terry Boyle (terry.boyle@unisa.edu.au).

Andrea Ramirez Varela, Assistant Professor at the School of Medicine of los Andes University in Colombia, South America.

As an epidemiologist I have been working as co-investigator across a number of research projects focussed on the COVID-19 pandemic.

The CoVIDA project (VIDA means life in Spanish) is interested in epidemiologic surveillance of COVID-19 in Bogotá, with the purpose of identifying and monitoring community transmission patterns of COVID-19 infection in communities, environments and territories of high and low epidemiological risk and selected populations under confinement to guide, evaluate and inform decisions of local authorities in the city.

This project complements and is integrated into the epidemiologic surveillance system of Bogotá and has two main windows: 1. Health workers in at least ten of the city's public-private health institutions. 2. Specific populations that are at higher risk of COVID-19 due to their occupation (such as taxi drivers, food and other item delivery personnel, general services, private security personnel, police, military, firefighters among others) or their place of residence (neighborhoods that have the highest rates of COVID-19 cases).

The project includes the standard questions of the mandatory epidemiological surveillance system in the country and also includes questions that will allow to assess risk factors associated with COVID-19 infection, identify routes of transmission and formulate better strategies to reduce and avoid the transmission of this virus person to person and in population groups. See: https://uniandes.edu.co/es/covida

The FARA-COVID cohort study (Acute Respiratory Failure in pediatric population study - Falla Aguda Respiratoria en Pediatria -FARA study by its acronym in spanish) is interested in examining the causes, associated factors, severity, and burden of disease of acute respiratory failure in children hospitalized in three major hospitals in Bogotá. FARA will include children diagnosed with COVID-19. Besides studying clinical characteristics, the study will achieve a fuller understanding of the psychosocial impact of the COVID-19 lockdown and assessment on the wellbeing of families and children hospitalized with respiratory symptoms and coinfection of COVID.

I am also a part of the Collaborative Group for Modeling COVID and Mobility in Colombia, bringing together Colombian academics and policy makers, interested in understanding the COVID-19 effect in public transportation in Colombia, its role in COVID-19 transmission and its consequences in population health (increased physical inactivity and sedentary behavior among others). Evidence-based policy recommendations have been delivered for ensuring safe trips and mitigating the negative effects for public health.

Brigid Lynch, Department of Health and Human Services, Victoria, Australia

When the COVID-19 pandemic started growing in Australia, our state health department recruited a surge workforce of epidemiologists, data scientists, public health physicians and nurses to help with the public health response. I was seconded on a part time basis from my 'business as usual' job in cancer epidemiology to work with the Department of Health and Human Services. Whilst most of Australia has, to date, managed to overcome the first wave of COVID-19 and successful eliminate or suppress the disease, Victoria has experienced a second wave that peaked at just under 800 cases per day. We're now down to under 200 cases per day, but we still have a long way to go until we can ease restrictions.

Since joining the response in May I've been involved in outbreak reporting, preparing the daily situation report for the state, and managing a weekly surveillance report that goes to external stakeholders. I'm also called to respond to ad hoc requests from our Chief Health Officer or Health Minister, such as 'what are the occupations most at risk of SARS-Cov-2 infection'? The intelligence we provide helps to inform the interventions put in place to prevent new infections in the state.

Left: Dr Andrea Ramirez Varela (Columbia);
Above: A/Prof Brigid Lynch (Australia)

Mediation analysis for understanding mechanisms: a brief introduction

S Ghazaleh Dashti

Clinical Epidemiology and Biostatistics Unit, Murdoch Children's Research Institute, Melbourne, Australia

A better understanding of the role of pathways in explaining the effect of an exposure (e.g. physical activity) on an outcome (heart disease) might not only be important for scientific understanding of mechanisms, but also for identifying potential new targets for risk-reducing interventions. Observational epidemiological studies can contribute to this knowledge by measuring relevant mediators reflecting these pathways and statistical mediation analyses of these mediator data can quantify their contribution to the effect of exposure on outcome.

The diagram in Figure 1 shows the basic setting of mediation, where *X* is the exposure, *Y* is the outcome, and *M* the mediator (for simplicity, confounders are not included in this figure). The total effect of *X* on *Y* is through all the solid arrows in Figure 1.A. In mediation analysis, the interest is in quantifying the part of this total effect that operates through the mediator *M* (i.e. the indirect effect shown by the solid arrows in Figure 1.B) and not through *M* (i.e. direct effect shown by the solid arrow in Figure 1.C).

Figure 1 Mediation of the effect of an exposure on an outcome

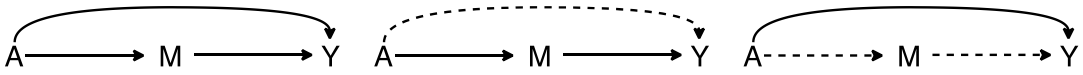

Figure 1.A – Solid arrows represent the total effect of exposure A (e.g. adiposity) on outcome Y (e.g. breast cancer diagnosis), which includes the effect through mediator M (e.g. estradiol) and not through M.

Figure 1.B – Solid arrows represent the indirect effect of A on Y through M.

Figure 1.C – Solid arrow represents the direct effect of A on Y not through M. The direct effect is relative to the included mediator and includes all the causal effects along the paths that do not go through M.

Some of the traditional mediation analysis approaches that allow such effect decomposition, within limits, have existed for over 30 years. An approach most commonly used in biomedical science is the difference method. This approach involves estimating the exposure-outcome association first without, then with the mediator in the regression model. Attenuation of the measure of association after including the mediator is taken as evidence of mediation. A limitation of the difference method is that it does not accommodate interactions between the effect of the exposure and mediator on the outcome, nor does it allow nonlinear exposure-outcome or mediator-outcome associations. Moreover, this approach does not extend to situations where multiple mediators affect or interact with each other. Ignoring dependences between involved mediators could lead to invalid conclusions about the presence and strength of mediation. It is, therefore, imperative to use proper mediation analysis methods that appropriately account for dependences between pathways.

In recent years, substantial advances have been made in mediation analysis methods, allowing estimation of the indirect and direct effects in more complex settings. These methodological advancements have, in general, relied on the causal inference literature, thus are broadly referred to as “causal mediation analysis” methods, and have been rooted in the counterfactual framework of causation. Under this definition, for a binary exposure, an individual has two counterfactual outcomes, outcome when exposed, and outcome had the individual been unexposed “with everything else remaining the same”, although only one outcome is observable. The resulting framework for causal mediation analysis allows effect decomposition even in the presence of exposure-mediator interaction and nonlinearities. More recently, extensions of this approach have become available that allow estimation of the indirect and direct effects in the presence of multiple interrelated and interacting mediators. These advancements are of particular interest for studies that aim to investigate the mediating role of several interrelated mechanistic pathways in the effect of exposure on outcome.

Disclaimer: this article draws heavily on the paper “Mediation Analysis: A Practitioner's Guide” (1), by Vanderweele, who is one of the most prolific researches in this field. The interested reader is referred to this paper and the textbook “Explanation in causal inference: methods for mediation and interaction” (2), for further reading on this topic.

References

1. VanderWeele TJ. Mediation Analysis: A Practitioner's Guide. *Annu Rev Public Health*. 2016;37:17-32.
2. VanderWeele T. Explanation in causal inference: methods for mediation and interaction. New York: Oxford Univ. Press; 2015.

Member profile: Jakob Tarp

Jakob Tarp is a member of the Epidemiological Council and a Post-doctoral researcher at the Norwegian School of Sports Sciences in Oslo. His post-doctoral research has focused on exploring the associations between device-measured physical activity, sedentary time and cardiorespiratory fitness with premature mortality based on data from large cohort studies such as the NHANES and UK Biobank. Jakob is currently working on determining if high levels of physical activity or cardiorespiratory fitness may counteract the effects of obesity on mortality. He is contributing to the Epidemiology Council’s ongoing ‘Physical Activity Cohort Studies Repository’ project.

Before moving to Oslo, Jakob completed doctoral training in physical activity epidemiology at the Department of Sports Sciences, University of Southern Denmark where he worked on two different school-based physical activity intervention studies. He has a special interest in epidemiological methodology and is keen on learning how to deal with limitations in observational data, particularly challenges with reverse causation and selection bias. Being Danish, he is strong believer of the potential for cycling as active transportation to increase public health and enjoys cycling both as transportation and recreation.