THE 7 HABITS OF A MODERATELY PRODUCTIVE EARLY-ISH CAREER EPIDEMIOLOGIST

Hailey R. Banack
March 15, 2024

School of Population Health Research and Public Health Day
McGill University, Montreal

Dalla Lana School of Public Health

UNIVERSITY OF TORONTO
DALLA LANA SCHOOL OF PUBLIC HEALTH

WHO AM I / WHAT AM I DOING HERE?

- I have no idea?

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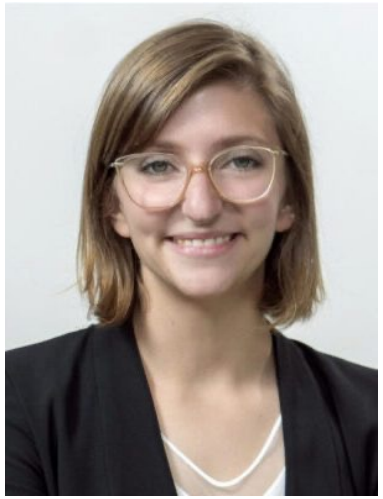

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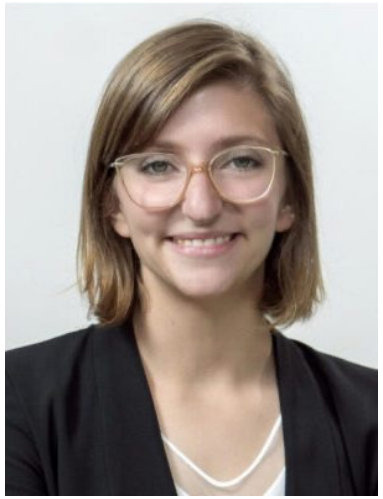

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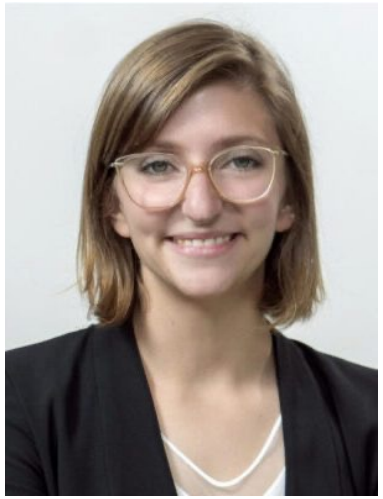
- Assistant Professor, Epidemiology Division, Dalla Lana School of Public Health
- Co-Host, SERious Epidemiology Podcast



ABOUT ME

Undergrad
Kinesiology

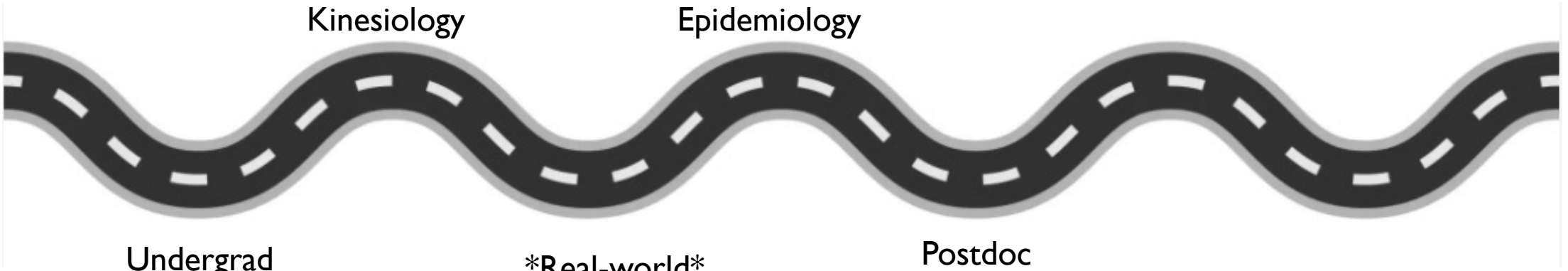
Master's
Kinesiology

Real-world

PhD
Epidemiology

Postdoc

Faculty
Dalla Lana
School of Public Health



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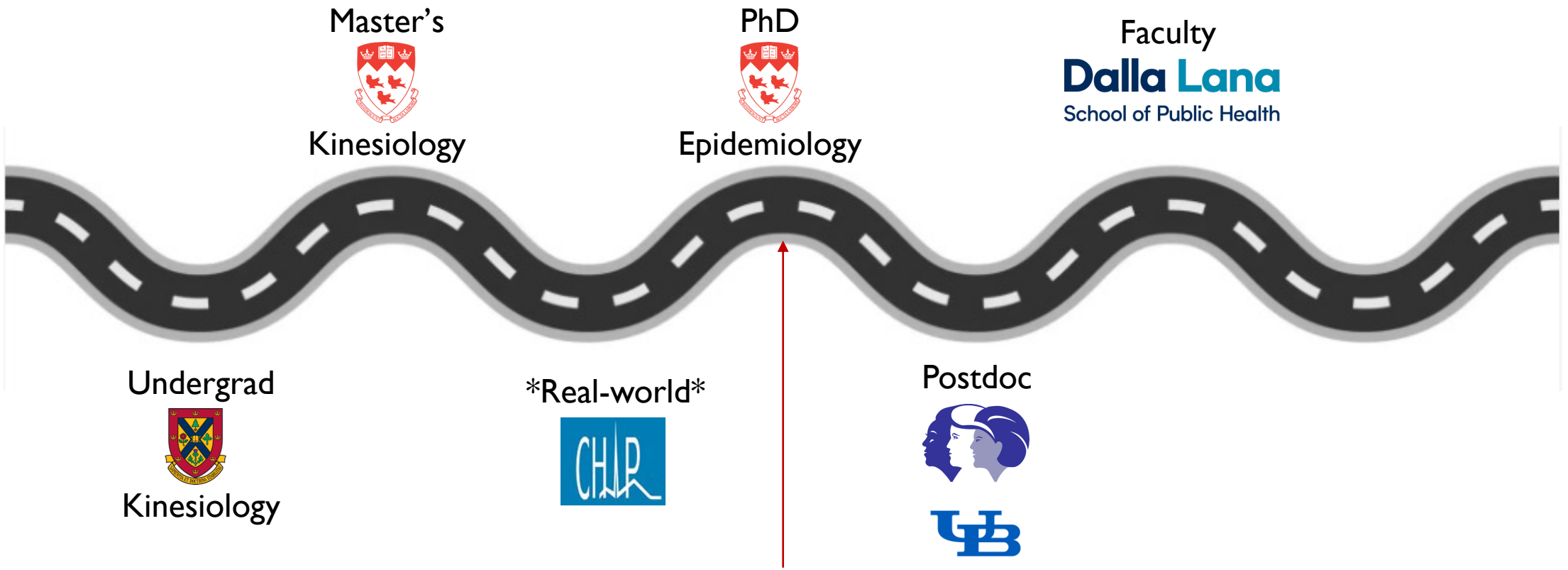

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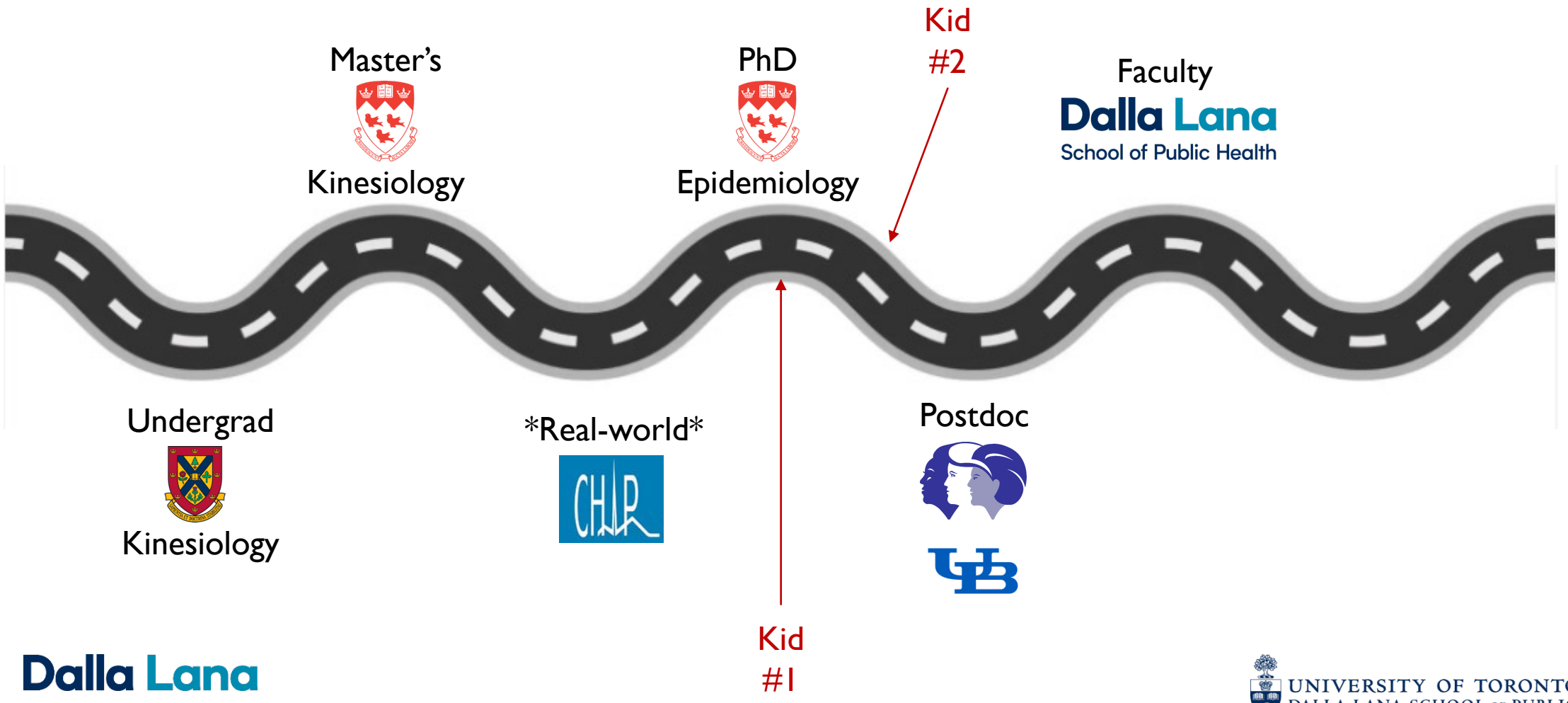
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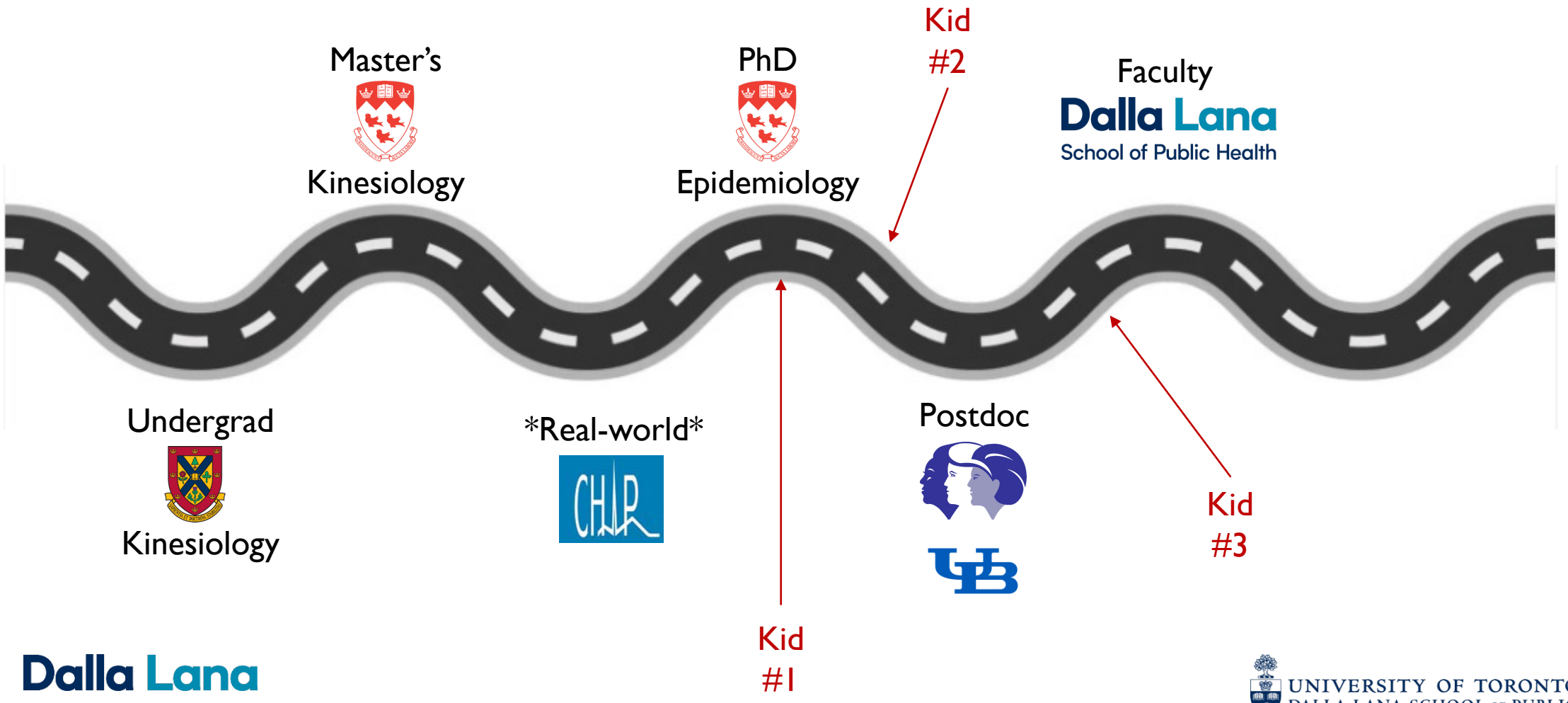

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SERIOUS EPI

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The Society for Epidemiologic Research

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7 HABITS OF A MODERATELY SUCCESSFUL EARLY-ISH CAREER EPIDEMIOLOGIST

A DISCLAIMER

- This is list of things that might be helpful to you
- Not a "one-size-fits-all" approach
  - Best (worst?) part of being an epidemiologist
- Don't let yourself be constrained by my experiences!

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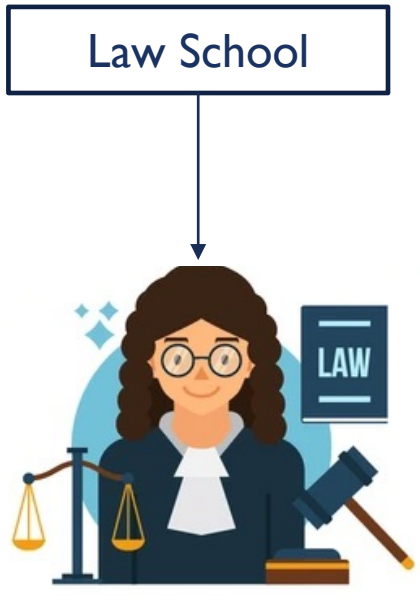

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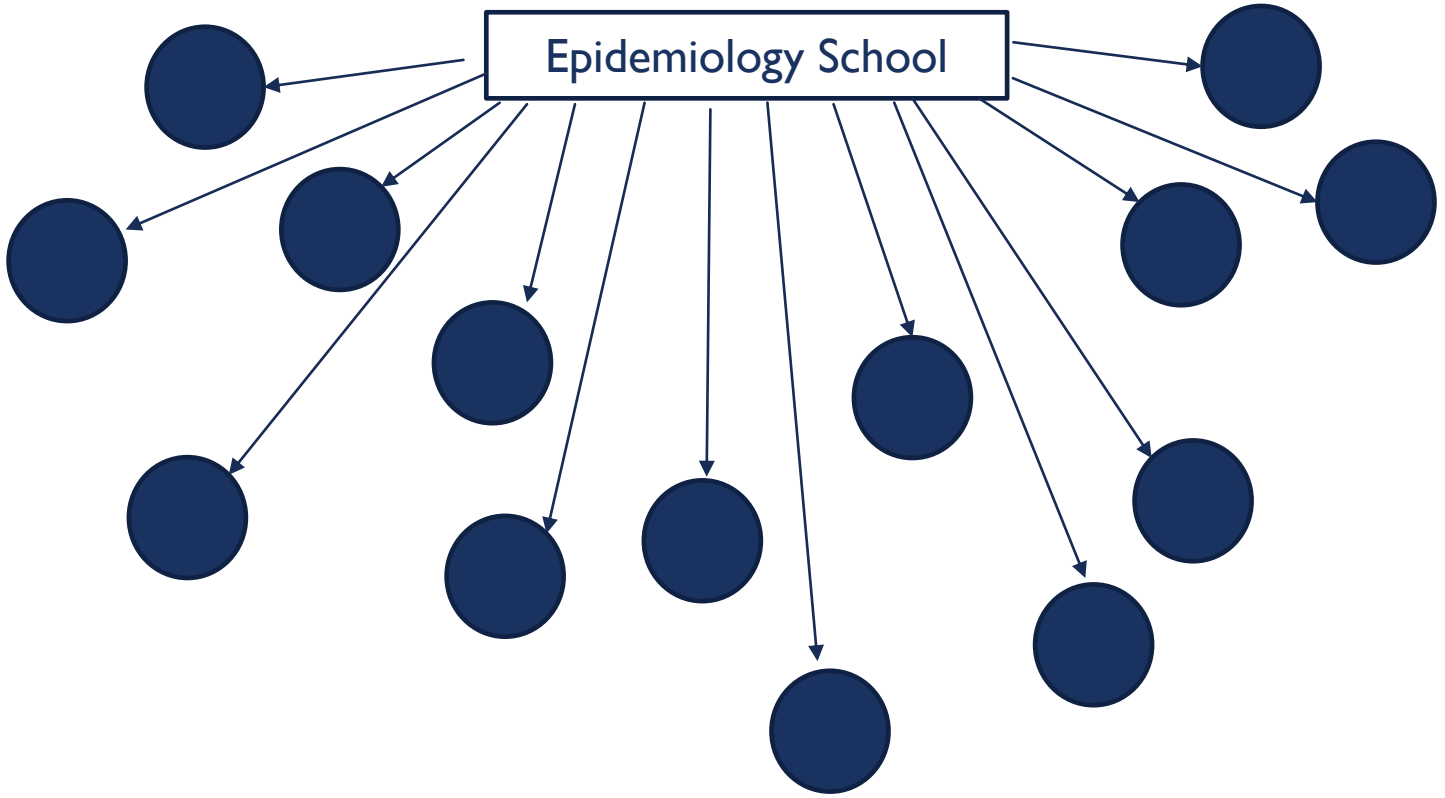

7. Find a topic that you love.

7. IMPORTANCE OF YOUR RESEARCH TOPIC

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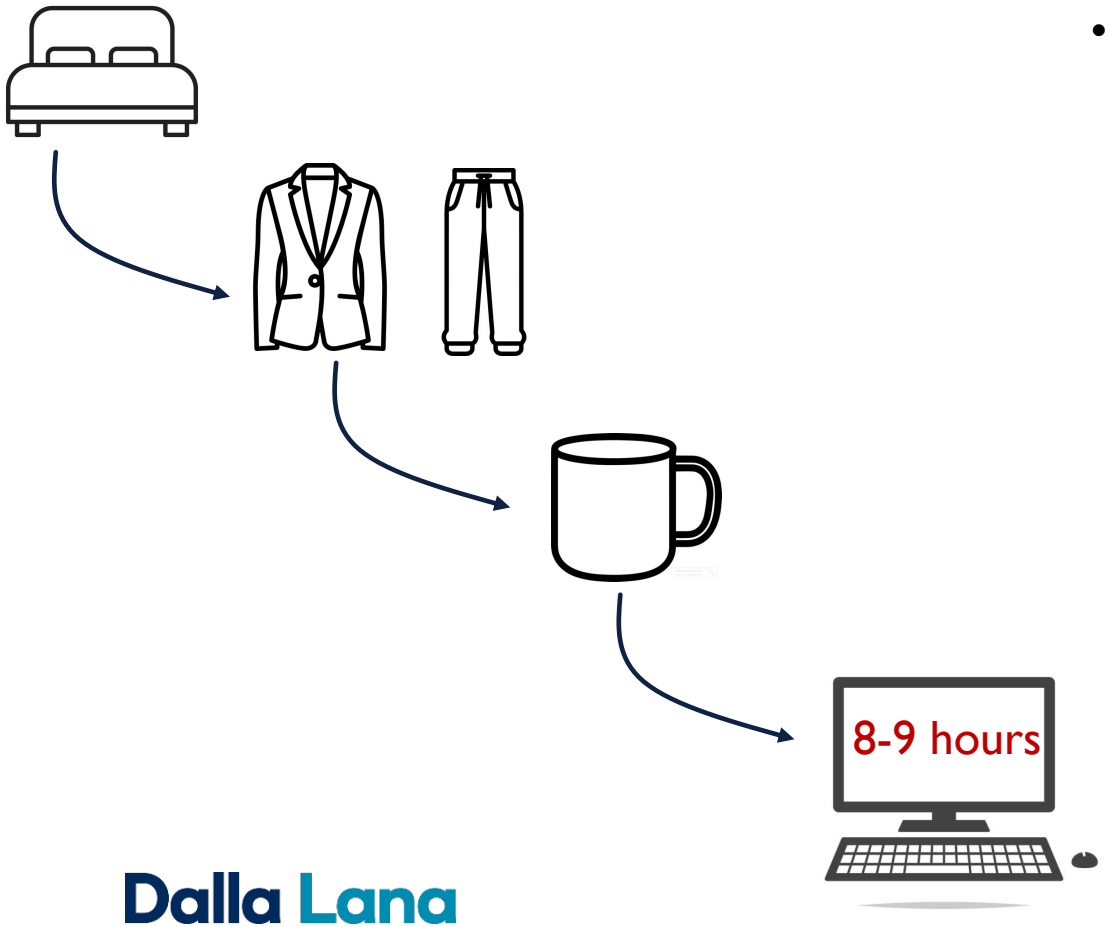

- Lived experience often plays a role

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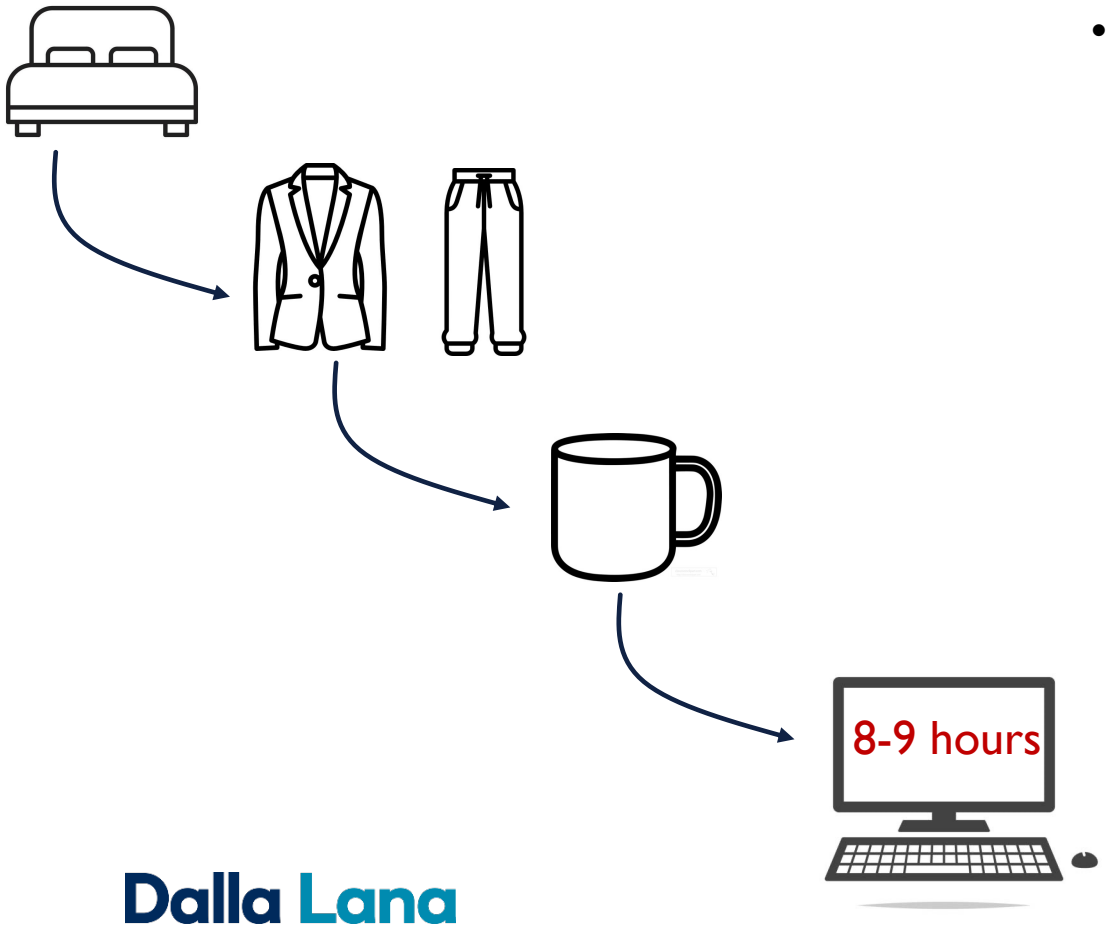

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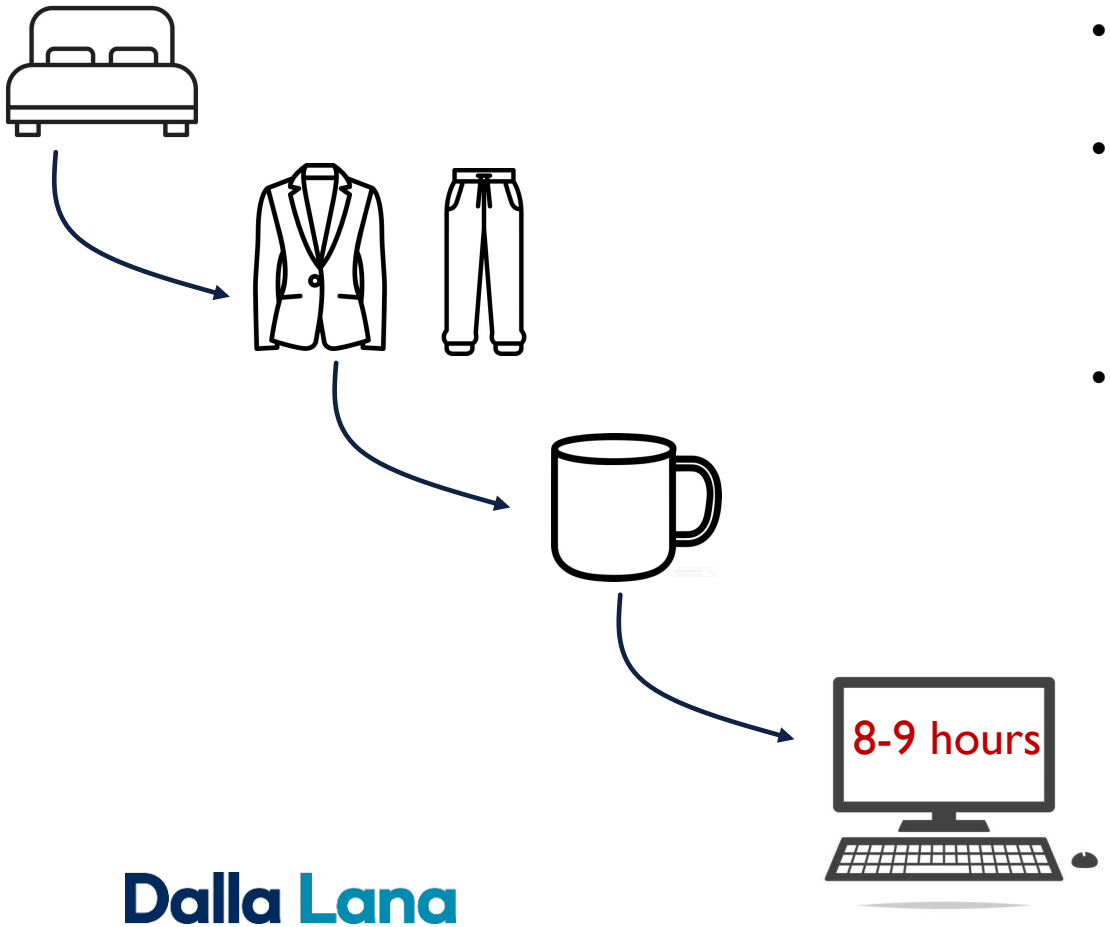

- Lived experience often plays a role
- This is your research
  **Not your supervisor's or classmate's or collaborator's*
- Having more than one interest is normal!

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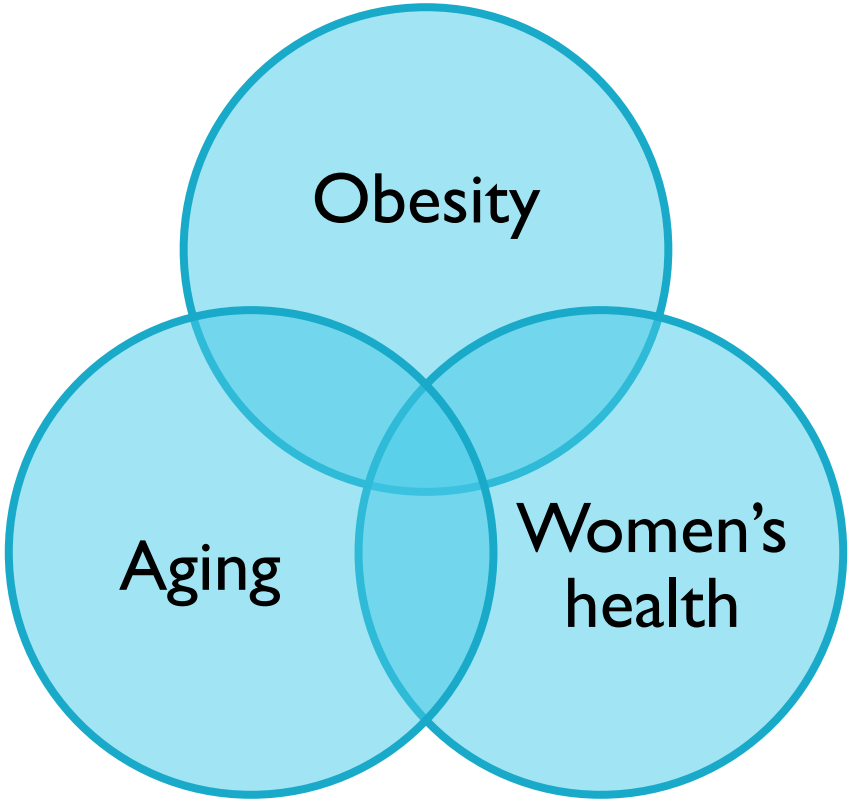
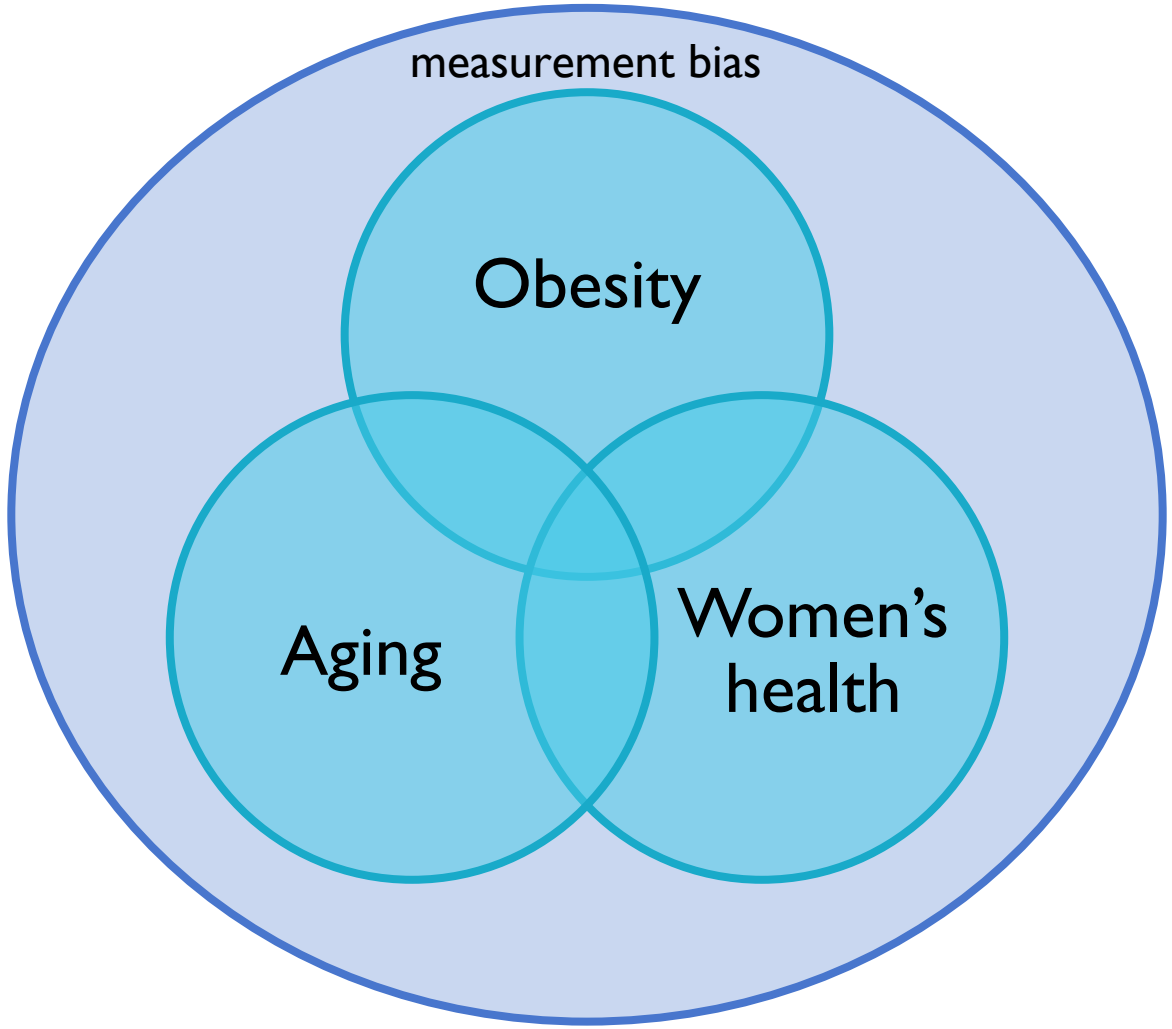

Obesity
Aging
Women's health


measurement bias
Obesity
Aging
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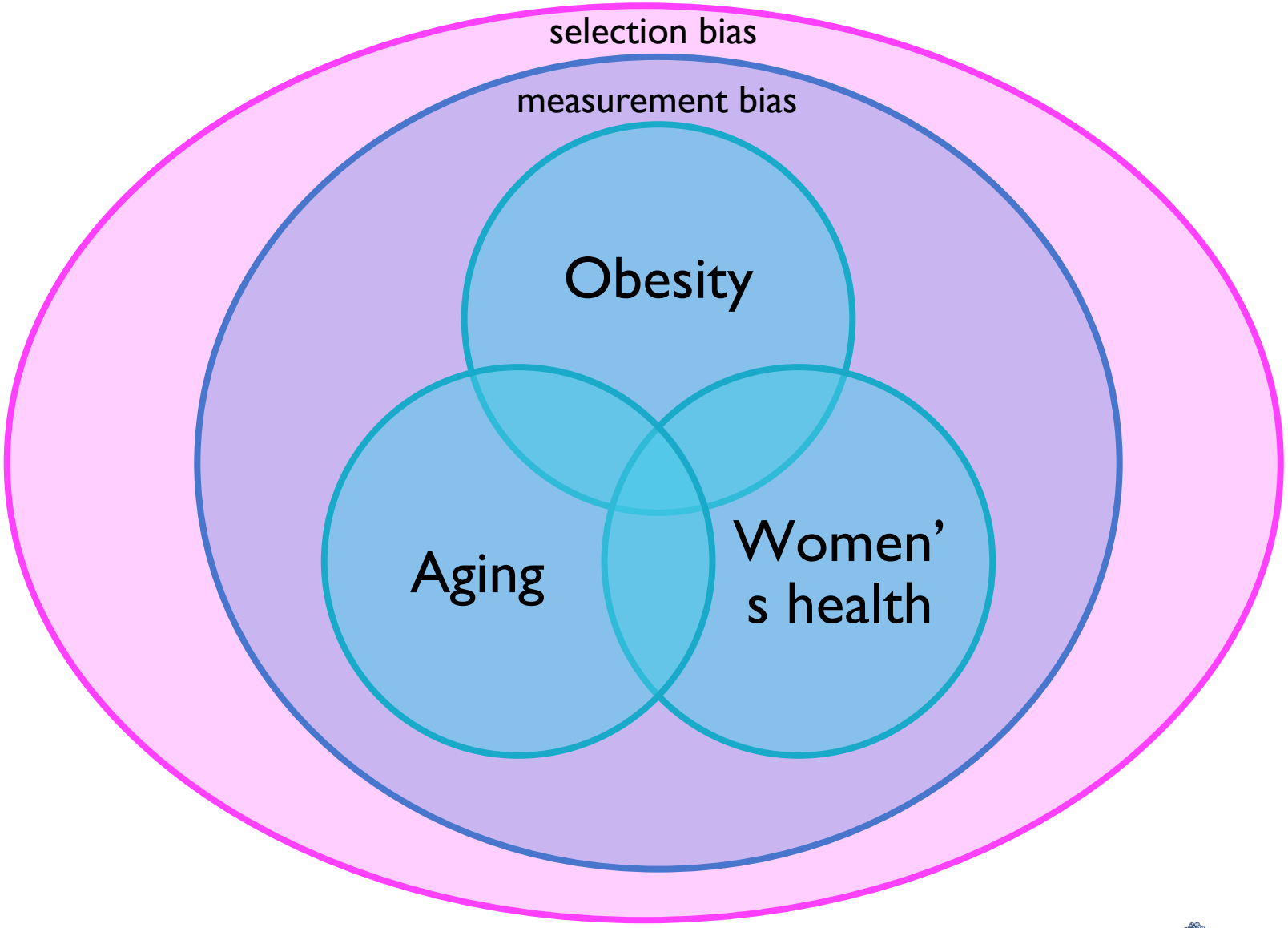
selection bias
measurement bias
Obesity
Aging
Women' s health

The "Obesity Paradox" Explained

To the Editor:

Several prospective studies have reported a J-shaped relationship between obesity and mortality, suggesting increased risk of death in the lowest and highest body mass index (BMI) groups in men and women of all ages, races, and ethnicities.[1] Although obesity is associated with a higher overall mortality risk in the general population, some authors have interpreted these patterns to suggest that obesity confers a survival advantage in surviving clinical subpopulations.[2] This "obesity paradox" has been reported for various disease groups including stroke, myocardial infarction, heart failure, renal disease, and diabetes.[2–5] We propose that this apparent paradox is simply the result of collider stratification, a source of selection bias that is common in epidemiologic research.[6]

The classic manifestation of this selection bias is a result of conditioning on a variable affected by exposure and sharing common causes with the outcome (known as a collider). Conditioning on a collider distorts the association between exposure and outcome among those selected for analysis and can therefore produce a spurious protective association between obesity and mortality in disease groups.

For illustrative purposes, we explore the obesity paradox in patients with heart failure (Figure). Among patients with stable heart failure, Curtis and colleagues[7] reported an unadjusted hazard ratio of mortality of 0.81 (95% confidence interval [CI]: 0.74, 0.88) for overweight participants and 0.70 (95% CI: 0.62, 0.78) for obese participants. To assess whether selection bias could be responsible for this protective association, we used data from the 1999–2000 and 2000–2001 National Health and Nutrition Examination Survey (NHANES), linked to mortality data from the National Death Index up to 31 December 2006. We created three BMI categories: normal weight (18.5–24.5 kg/m^2), overweight (25.0–29.9 kg/m^2), and obese (>30 kg/m^2). We stratified the dataset on heart failure status and then calculated sampling fractions by dividing the number of participants in each cell of the 2×3 table stratified by heart failure by the number of participants in the corresponding cell of the unstratified table (See eAppendix, http://links.lww.com/EDE/A668). Using a simple selection bias correction formula, we calculated crude odds ratios for being overweight or obese relative to normal weight, and adjusted the odds ratios for selection bias using sampling fractions.[8] All analyses were conducted using Stata software version 11 (StataCorp).

In the complete NHANES cohort (n = 11,429), 256 people of normal weight, 258 overweight, and 528 obese people died prior to 31 December 2006, whereas among those with heart failure, 29, 34, and 111 persons in the normal weight, overweight, and obese categories died. The crude odds ratio was 0.79 (95% CI: 0.70–0.88) for overweight and 0.65 (0.57–0.74) for obese—similar to the findings of Curtis and colleagues. After adjusting for selection bias, however, overweight and obesity no longer appeared protective. The corrected odds ratios were 1.88 (1.69–2.09) for overweight and 1.07 (0.94–1.22) for obese. The crude risks were biased by 58% for overweight and 39% for obese due to selection bias alone.

Using sampling fractions from a population-based cohort, we were able to correct for selection bias due to conditioning on a collider. Although this deterministic bias analysis fails to account for several sources of uncertainty, it provides one simple and sufficient explanation for why the "obesity paradox" occurs. Future analyses should correct for survivor selection with probabilistic bias analysis techniques or inverse probability-of-censoring weights. The present analysis emphasizes that "paradoxes" should be met with skepticism and suggests that obesity is not protective among those with heart failure, or likely for any other disease state. It also serves as a reminder of the importance of using graphical tools, such as directed acyclic graphs, to assess sources of bias.

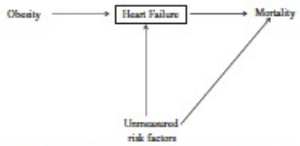

FIGURE. Directed acyclic graph of the hypothesized effects of obesity on mortality among individuals with heart failure. Potential unmeasured risk factors include a genetic factors and lifestyle behaviors.

Hailey R. Banack
Department of Epidemiology, Biostatistics, and Occupational Health
McGill University
Montreal, Quebec, Canada
hailey.banack@mail.mcgill.ca

Jay S. Kaufman
Department of Epidemiology, Biostatistics, and Occupational Health
McGill University
Montreal, Quebec, Canada

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1. Adams KF, Schatzkin A, Harris TB, et al. Overweight, obesity, and mortality in a large prospective cohort of persons 50 to 71 years old. *N Engl J Med*. 2006;355:763–778.
2. McAuley PA, Blair SN. Obesity paradoxes. *J Sports Sci*. 2011;29:773–782.

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OPEN

Application of a Web-based Tool for Quantitative Bias Analysis

The Example of Misclassification Due to Self-reported Body Mass Index

Hailey R. Banack,[a] Samantha N. Smith,[b] and Lisa M. Bodnar[c]

Background: We describe the use of Apisensr, a web-based application that can be used to implement quantitative bias analysis for misclassification, selection bias, and unmeasured confounding. We apply Apisensr using an example of exposure misclassification bias due to use of self-reported body mass index (BMI) to define obesity status in an analysis of the relationship between obesity and diabetes.
Methods: We used publicly available data from the National Health and Nutrition Examination Survey. The analysis consisted of: (1) estimating bias parameter values (sensitivity, specificity, negative predictive value, and positive predictive value) for self-reported obesity by sex, age, and race–ethnicity compared to obesity defined by measured BMI, and (2) using Apisensr to adjust for exposure misclassification.
Results: The discrepancy between self-reported and measured obesity varied by demographic group (sensitivity range: 75%–89%; specificity range: 91%–99%). Using Apisensr for quantitative bias analysis, there was a clear pattern in the results: the relationship between obesity and diabetes was underestimated using self-report in all age, sex, and race–ethnicity categories compared to measured obesity. For example, in non-Hispanic White men aged 40–59 years, prevalence odds ratios for diabetes were 3.06 (95% confidence inerval = 1.78, 5.30) using self-reported BMI and 4.11 (95% confidence interval = 2.56, 6.75) after bias analysis adjusting for misclassification.
Conclusion: Apisensr is an easy-to-use, web-based Shiny app designed to facilitate quantitative bias analysis. Our results also provide estimates of bias parameter values that can be used by other researchers interested in examining obesity defined by self-reported BMI.

Keywords: BMI; Measurement bias; Misclassification; Quantitative bias analysis

(*Epidemiology* 2024;35: 00–00)

Approaches for quantitative bias analysis have been well described in the epidemiologic literature, yet uptake of such methods remains low.[1] There are textbooks on the topic,[2] including user-friendly spreadsheets, add-on software packages for Stata[3] and R, and SAS macros.[4] In 2014, Lash and colleagues[1] suggested that a key barrier to implementation is that researchers may lack training in quantitative bias analysis approaches. However, nearly 10 years later, there is still a tendency for authors to provide qualitative descriptions of potential bias rather than a quantitative assessment of the magnitude and direction of bias. Improving the uptake of quantitative bias analysis requires both increased training opportunities and accessible tools to facilitate the implementation of such approaches.

In this manuscript, we describe the use of Apisensr, a web-based application designed for quantitative bias analysis. This tool enables epidemiologists and other health science researchers to incorporate quantitative bias analysis into their work. A key benefit of Apisensr is that it does not require any statistical software or programming expertise; thus, it is designed for researchers who possess foundational knowledge about bias but need assistance with the implementation of bias analyses. Apisensr is freely available online at https://dhaine.shinyapps.io/apisensr/. It is an easy-to-use web-based Shiny app that implements the code available in the R package episensr, or, equivalently, Stata's episens package. Additional information about episensr including

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From the [a]Epidemiology Division, Dalla Lana School of Public Health, University of Toronto, Toronto, ON, Canada; [b]Department of Epidemiology and Environmental Health, State University of New York at Buffalo, Buffalo, NY; and [c]School of Public Health, University of Pittsburgh, Pittsburgh, PA.
H.R.B. is supported by the National Cancer Institute of the National Institutes of Health under award number R37CA258761. S.N.S. was funded by a National Cancer Institute, NCI, T32 CA113951.
NHANES data are available for download from the National Center for Health Statistics. Software code is available in the eAppendix; http://links.lww.com/EDE/C114.

SDC Supplemental digital content is available through direct URL citations in the HTML and PDF versions of this article (www.epidem.com).

Correspondence: Hailey R. Banack, Epidemiology Division, Dalla Lana School of Public Health, University of Toronto, 155 College Street, 6th floor, Toronto, ON M5T 3M7, Canada. E-mail: hailey.banack@utoronto.ca.

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NTO
BLIC HEALTH

apisensr: Quantitative bias analysis with episensr

SIMPLE ANALYSIS WITH 2-BY-2 TABLE | SIMPLE ANALYSIS WITH MULTIPLE TABLES | SIMPLE ANALYSIS, NO 2-BY-2 TABLE | PROBABILISTIC ANALYSIS

Choose bias analysis:
Selection bias

Observed data

	Exposed	Unexposed
Cases	136.00	107.00
Noncases	297.00	165.00

TABLE BACK TO EXAMPLE

Providing Selection-bias factor instead of Selection probabilities

Selection probability among cases exposed: 0.94

Selection probability among cases unexposed: 0.85

Selection probability among noncases exposed: 0.64

Selection probability among noncases unexposed: 0.25

```
--Observed data--
         Outcome: Cases
       Comparing: Exposed vs. Unexposed

          Exposed Unexposed
Cases         136       107
Noncases      297       165

                                              2.5%     97.5%
Observed Relative Risk: 0.7984287 0.6518303 0.9779975
   Observed Odds Ratio: 0.7061267 0.5143958 0.9693215
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Selection Bias Corrected Relative Risk: 1.483780
   Selection Bias Corrected Odds Ratio: 1.634608
```

6. Epidemiology is a team sport.

6. EPIDEMIOLOGY IS A TEAM SPORT

- Look around, these are the folks that will support you throughout school and your career

- Find people you like to work with and you work well with

- Get to know your collaborators outside of work

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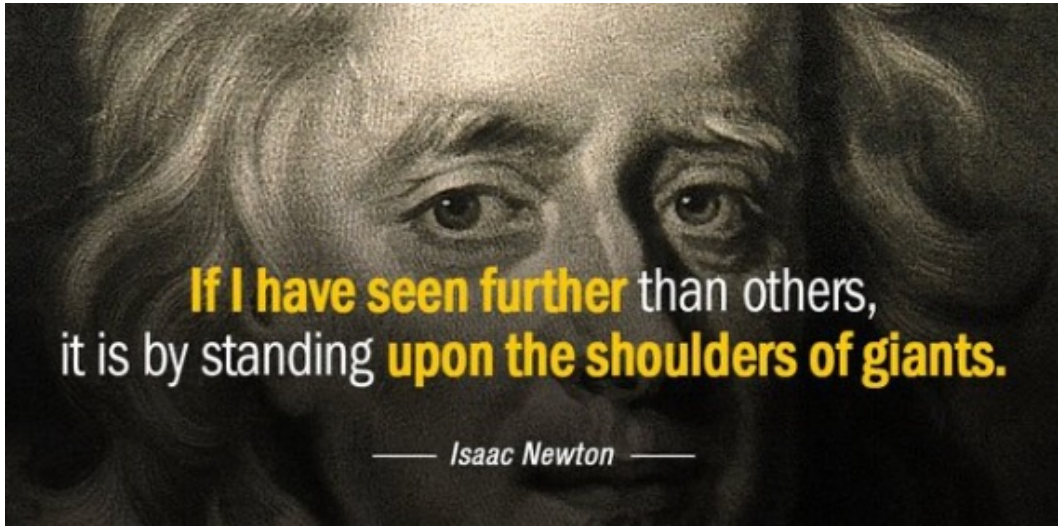

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REMEMBER: DATA COMES FROM REAL PEOPLE

- Secondary data analysis is cool and all, but have you tried primary data collection?
- **There is no data without study participants**

Age group	N (Percent)
75-79	5985 (11.7)
80-84	16309 (32.0)
85-89	15639 (30.7)
90-94	9362 (18.4)
95-106	3660 (7.2)

Unique challenges of working with this population (mean age=86y)

5. Swim upstream.

5. SWIM UPSTREAM TO MAKE AN IMPACT

- Swimming downstream is easy.
- Swim upstream to make a lasting impact.

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The training you are getting at McGill will propel you forward.

I still refer to my course notes and assignments all the time.

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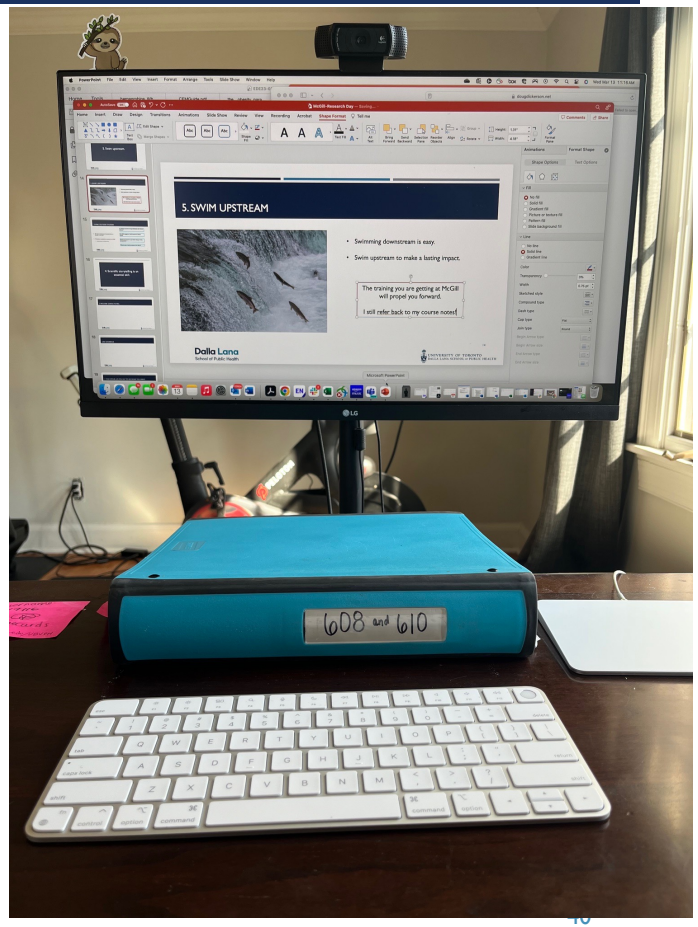

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CHALLENGE EXISTING PARADIGMS

Just because something's always been done a certain way, doesn't mean it should continue to be done that way.

Dr. Katherine Flegal, PhD

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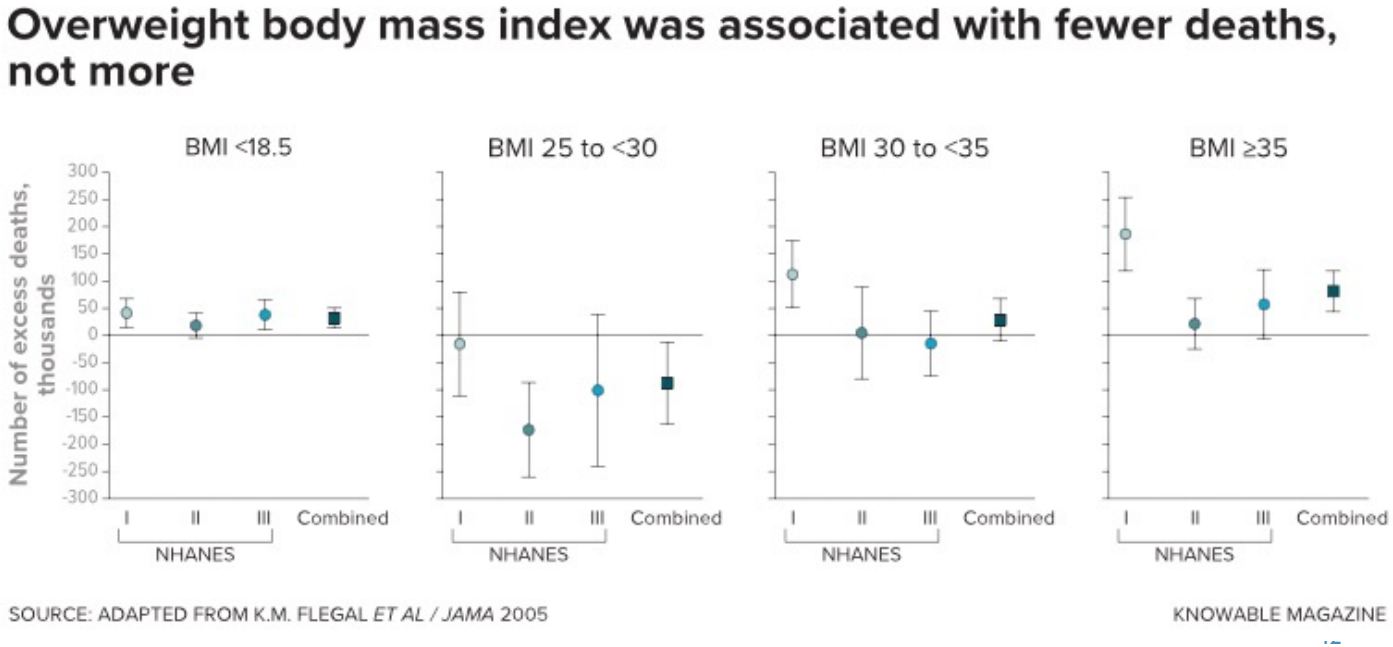

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REVIEW

Association of All-Cause Mortality With Overweight and Obesity Using Standard Body Mass Index Categories

A Systematic Review and Meta-analysis

Katherine M. Flegal, PhD
Brian K. Kit, MD
Heather Orpana, PhD
Barry I. Graubard, PhD

Importance Estimates of the relative mortality risks associated with normal weight, overweight, and obesity may help to inform decision making in the clinical setting.

Objective To perform a systematic review of reported hazard ratios (HRs) of all-cause mortality for overweight and obesity relative to normal weight in the general population.

Data Sources PubMed and EMBASE electronic databases were searched through September 30, 2012, without language restrictions.

Study Selection Articles that reported HRs for all-cause mortality using standard body mass index (BMI) categories from prospective studies of general populations of adults were selected by consensus among multiple reviewers. Studies were excluded that used non-standard categories or that were limited to adolescents or to those with specific medical conditions or to those undergoing specific procedures. PubMed searches yielded 7034 articles, of which 141 (2.0%) were eligible. An EMBASE search yielded 2 additional articles. After eliminating overlap, 97 studies were retained for analysis, providing a combined sample size of more than 2.88 million individuals and more than 270 000 deaths.

Data Extraction Data were extracted by 1 reviewer and then reviewed by 3 independent reviewers. We selected the most complex model available for the full sample and used a variety of sensitivity analyses to address issues of possible overadjustment (adjusted for factors in causal pathway) or underadjustment (not adjusted for at least age, sex, and smoking).

Results Random-effects summary all-cause mortality HRs for overweight (BMI of 25-<30), obesity (BMI of ≥30), grade 1 obesity (BMI of 30-<35), and grades 2 and 3 obesity (BMI of ≥35) were calculated relative to normal weight (BMI of 18.5-<25). The summary HRs were 0.94 (95% CI, 0.91-0.96) for overweight, 1.18 (95% CI, 1.12-1.25) for obesity (all grades combined), 0.95 (95% CI, 0.88-1.01) for grade 1 obesity, and 1.29 (95% CI, 1.18-1.41) for grades 2 and 3 obesity. These findings persisted when limited to studies with measured weight and height that were considered to be adequately adjusted. The HRs tended to be higher when weight and height were self-reported rather than measured.

Conclusions and Relevance Relative to normal weight, both obesity (all grades) and grades 2 and 3 obesity were associated with significantly higher all-cause mortality. Grade 1 obesity overall was not associated with higher mortality, and overweight was associated with significantly lower all-cause mortality. The use of predefined standard BMI groupings can facilitate between-study comparisons.

JAMA. 2013;309(1):71-82 www.jama.com

For editorial comment see p 87.

CME available online at www.jamaarchivescme.com and questions on p 91.

Author Video Interview available at www.jama.com.

Author Affiliations: National Center for Health Statistics, Centers for Disease Control and Prevention, Hyattsville, Maryland (Drs Flegal and Kit); School of Psychology, University of Ottawa, Ottawa, Ontario, Canada (Dr Orpana); and Division of Cancer Epidemiology and Genetics, National Cancer Institute, Bethesda, Maryland (Dr Graubard).
Corresponding Author: Katherine M. Flegal, PhD, National Center for Health Statistics, Centers for Disease Control and Prevention, 3311 Toledo Rd, Room 4336, Hyattsville, MD 20782 (kmf2@cdc.gov).

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Data Extraction Data were extracted by 1 reviewer and then reviewed by 3 independent reviewers. We selected the most complex model available for the full sample and used a variety of sensitivity analyses to address issues of possible overadjustment (adjusted for factors in causal pathway) or underadjustment (not adjusted for at least age, sex, and smoking).

Results Random-effects summary all-cause mortality HRs for overweight (BMI of 25-<30), obesity (BMI of ≥30), grade 1 obesity (BMI of 30-<35), and grades 2 and 3 obesity (BMI of ≥35) were calculated relative to normal weight (BMI of 18.5-<25). The summary HRs were 0.94 (95% CI, 0.91-0.96) for overweight, 1.18 (95% CI, 1.12-1.25) for obesity (all grades combined), 0.95 (95% CI, 0.88-1.01) for grade 1 obesity, and 1.29 (95% CI, 1.18-1.41) for grades 2 and 3 obesity. These findings persisted when limited to studies with measured weight and height that were considered to be adequately adjusted. The HRs tended to be higher when weight and height were self-reported rather than measured.

Conclusions and Relevance Relative to normal weight, both obesity (all grades) and grades 2 and 3 obesity were associated with significantly higher all-cause mortality. Grade 1 obesity overall was not associated with higher mortality, and overweight was associated with significantly lower all-cause mortality. The use of predefined standard BMI groupings can facilitate between-study comparisons.

JAMA. 2013;309(1):71-82 www.jama.com

For editorial comment see p 87.

CME available online at www.jamaarchivescme.com and questions on p 91.

Author Video Interview available at www.jama.com.

Author Affiliations: National Center for Health Statistics, Centers for Disease Control and Prevention, Hyattsville, Maryland (Drs Flegal and Kit); School of Psychology, University of Ottawa, Ottawa, Ontario, Canada (Dr Orpana); and Division of Cancer Epidemiology and Genetics, National Cancer Institute, Bethesda, Maryland (Dr Graubard).
Corresponding Author: Katherine M. Flegal, PhD, National Center for Health Statistics, Centers for Disease Control and Prevention, 3311 Toledo Rd, Room 4336, Hyattsville, MD 20782 (kmf2@cdc.gov).

REVIEW

Association of All-Cause Mortality With Overweight and Obesity Using Standard Body Mass Index Categories

A Systematic Review and Meta-analysis

Katherine M. Flegal, PhD
Brian K. Kit, MD
Heather Orpana, PhD
Barry I. Graubard, PhD

Importance Estimates of the relative mortality risks associated with normal weight, overweight, and obesity may help to inform decision making in the clinical setting.

Objective To perform a systematic review of reported hazard ratios (HRs) of all-cause mortality for overweight and obesity relative to normal weight in the general population.

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THE TOPIC OF THE MORTALITY differences between weight categories has sometimes been described as controversial.[1] The appearance of controversy may arise in part because studies of body mass index (BMI; calculated as weight in kilograms divided by height in meters squared) and mortality have used a wide variety of BMI categories and varying reference categories, which can make findings appear more variable than when standard categories are used and also can make it difficult to compare and synthesize studies. A report[2] in 1997 from the World Health Organization Consultation on Obesity defined BMI-based categories of underweight, normal weight, preobesity, and obesity. The same cutoff BMI values were adopted by the National Heart, Lung, and Blood Institute in 1998.[3]

In this study, we used the National Heart, Lung, and Blood Institute's

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Two takeaways:

1. Swimming upstream is not easy
2. There is never, ever, EVER a justification for ad hominem attacks

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DALLA LANA SCHOOL OF PUBLIC HEALTH

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The obesity wars and the education of a researcher: A personal account

Katherine M. Flegal *

Stanford Prevention Research Center, Department of Medicine, Stanford University School of Medicine, Stanford, CA, USA

ARTICLE INFO

ABSTRACT

Dalla Lana School of Public Health

ALTH

BMI is not a supervillain.

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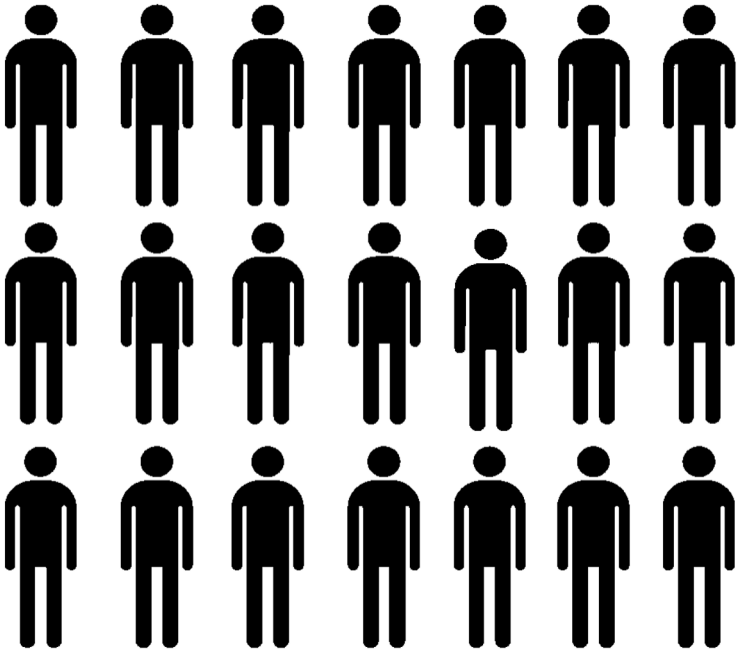
BMI is not a supervillain.

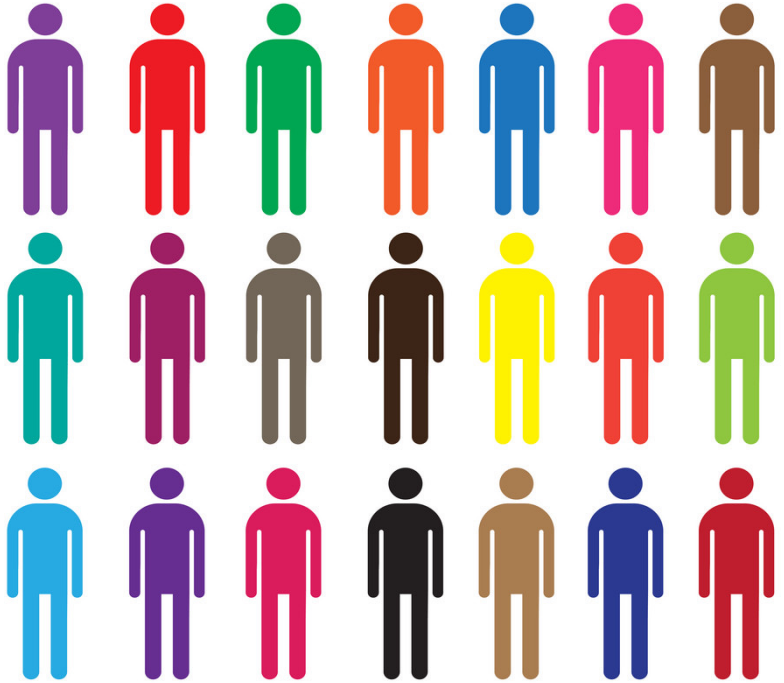
It's a ratio.

Problem (most often) lies in how it's used and interpreted.

4. Think outside the box

WE'RE NOT BUILDING A CLONE ARMY





THINK OUTSIDE THE BOX

- **Creativity is essential to success**
  - Extend what is already known

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Is obesity protective among individuals with chronic disease?

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Are BMI categories a valid measure of obesity status?

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Should we just ignore age-related change in body composition?

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  - Extend what is already known

Is obesity protective among individuals with chronic disease?

Are BMI categories a valid measure of obesity status?

Should we just ignore age-related change in body composition?

Muscle mass is hard to measure. Let's skip it?

TELL YOUR STORY CREATIVELY

Evaluation criteria: originality of the proposal, innovation

- Evaluate whether the proposed work applies novel concepts, methods or technologies or uses existing concepts, methods, technologies in novel ways, to enhance the overall impact of the project.

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Practice the art of storytelling

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- Muscle mass is critically understudied in population health research
  - Essential for health aging, preventing morbidity, and mortality

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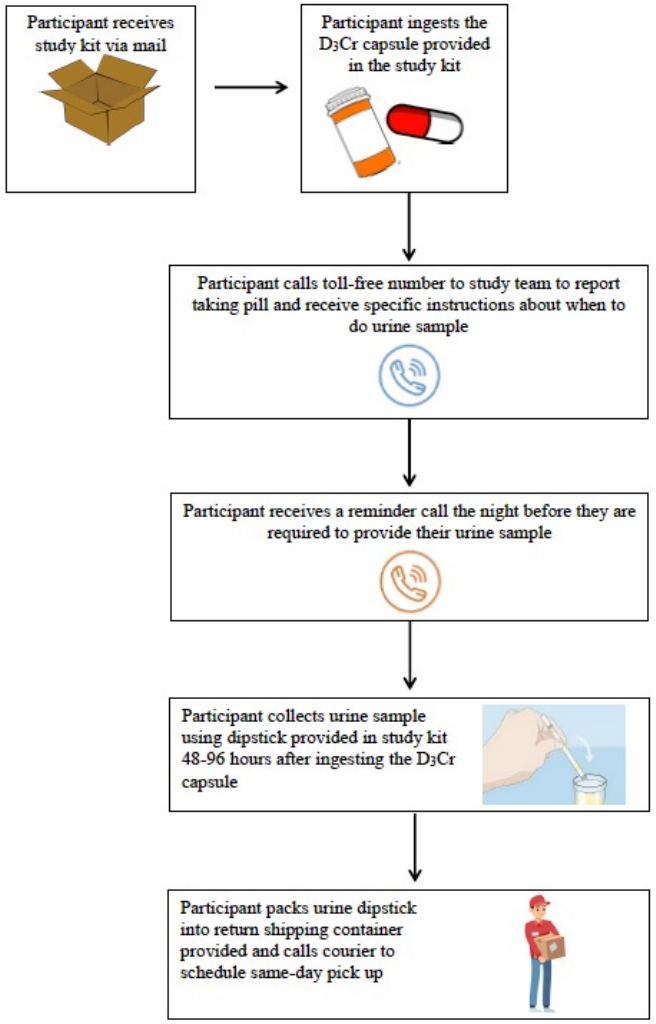

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BE INNOVATIVE, BUT SHOW US YOU CAN DO IT

- Pilot grants, seed funding, small awards are absolutely essential for success

- Easier to get than big awards
- Show proof-of-concept
- Great for building your CV

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3. You are going to fail.

I nearly failed Grade 12 calculus .

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I was rejected by CIHR Master's/Doctoral awards 5 separate times.

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My current NIH R01 was funded on its 4th (!!) submission

I cannot even begin to count the number of times my papers have been rejected by journals

YOUR CV OF FAILURES

- It's not about how many times you are going to fail, it's about how quickly you get back up again
- Refer back to epidemiology is a team sport
- Figure out what works for you

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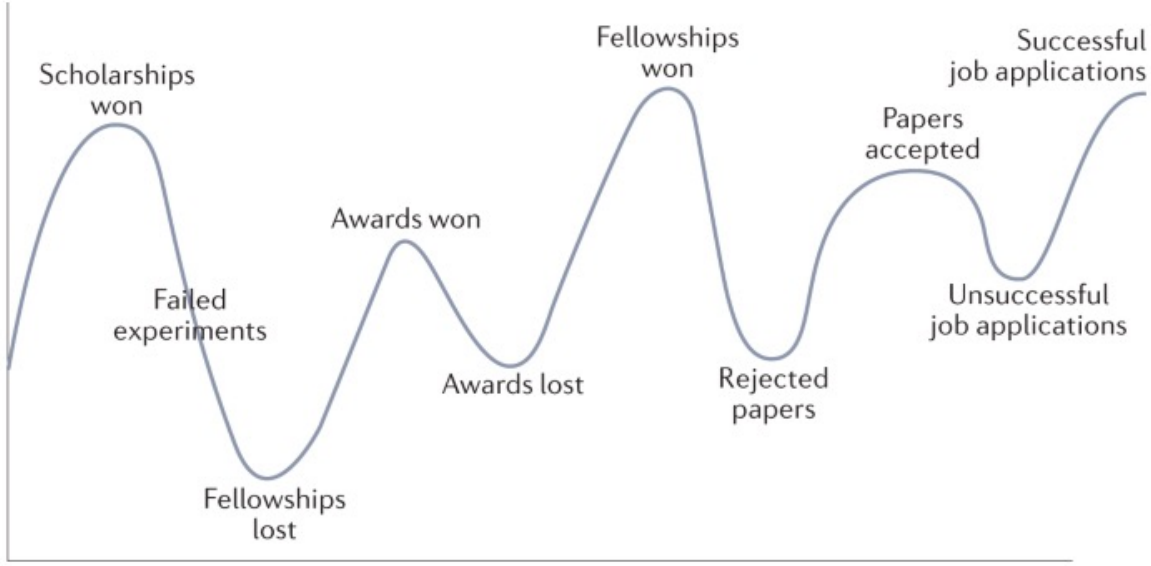


We need to normalize failure!

(Cao & Ngetich, 2023)

2. Be generous.

TIME IS OUR MOST PRECIOUS COMMODITY

- My first interaction with Matt Fox was a cold email
  - His generosity made a huge impact
  - There are a lot of very nice people in our field
- A lot of the motivation for SERious Epi cames from my own questions
- Ethos of 'giving back' to the community

PEER REVIEW

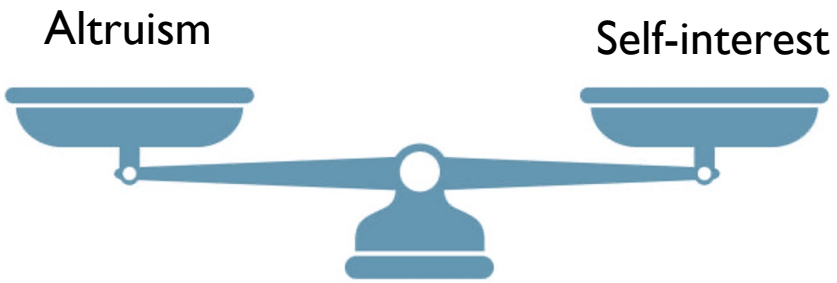
- Generosity of time: contributing to the peer review process

Altruism

- Provides constructive feedback to authors
- Advances the field

Self-interest

- Makes you a better researcher & writer
- Keeps you informed



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Set boundaries!

LEAVE THE WORLD (FIELD) A BETTER PLACE THAN WHEN YOU FOUND IT

Your training makes you a hot commodity (and don't forget it!)

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1. This is your life and you get to do what you want with it.

You did a postdoc in BUFFALO? REALLY?

- I often get asked by trainees: "where should I go for my PhD/postdoc/job"?
- {insert classic epidemiology joke here}

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- {insert classic epidemiology joke here}

It depends!

YOU CAN BE SUCCESSFUL NO MATTER WHERE YOU ARE

- Going to {insert big name school here} doesn't guarantee success, *not going* to {insert name of big name school here} doesn't guarantee lack of success

- There is fantastic epidemiology, PH, and health sciences research in a lot of places

- Diversity is our strength

- You need to figure out what you want your life, your career, your path to look like.

(then you have to make it happen)

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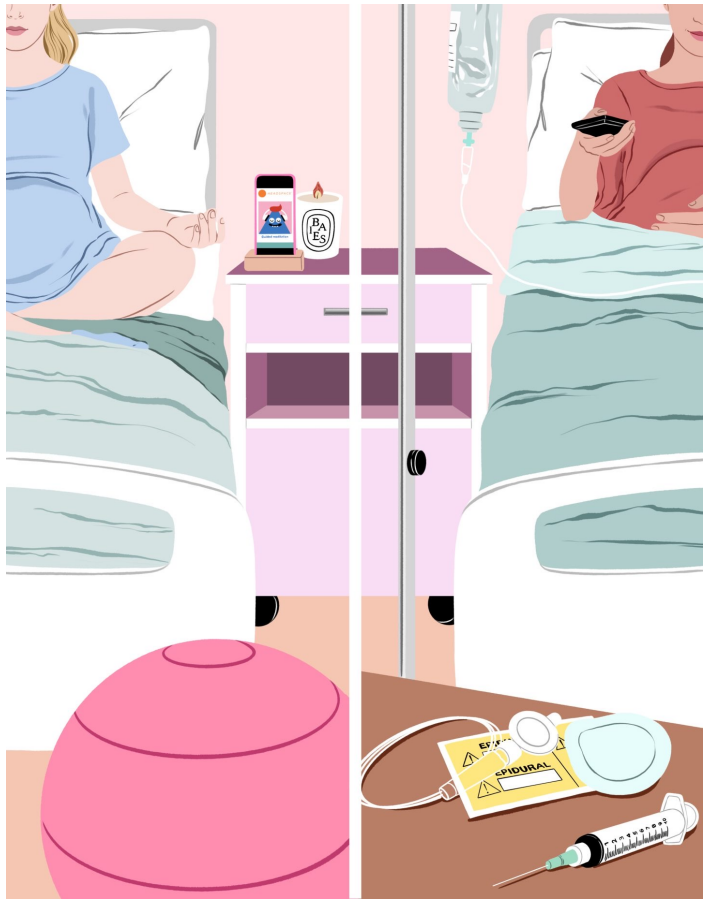


Life happens while you're
in grad school, for
everyone.

Thank you!

hailey.banack@utoronto.ca