Milken Institute School of Public Health

RESEARCH DAY

Abstract Booklet

2024
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Message from the Dean

Dear GWSPH Community,

Welcome to the Milken Institute School of Public Health's 27th Annual Research Day. Research Day holds a special place in my heart as it marks a celebration of our students' accomplishments, highlighting their dedication and recognizing the mentorship that fuels their excellence. This event underscores our school’s commitment to fostering creativity, focused inquiry and profound discoveries across all disciplines.

GWSPH boasts a rich history of research excellence, with noteworthy achievements from both students and faculty. Our school's hallmark emphasis on interdisciplinary research and collaboration, combined with access to cutting-edge technology and world-class laboratories, provides an unparalleled educational experience.

Engaging in Research Day provides a valuable chance to master effective communication, storytelling, and connecting with individuals from diverse backgrounds. Our students will carry forward these skills, shaping them into future, dynamic public health leaders. This journey of discovery is a crucial aspect of their academic endeavors, fostering enhanced learning and meaningful relationships with faculty, professionals and peers.

I extend my sincere appreciation to all participating students for their awe-inspiring work. My deepest gratitude goes to those supporting these outstanding students and helping them reach their goals. I invite and encourage you to explore the exceptional work of our presenters and engage with our remarkable students.

Thank you for being an integral part of this community.

Warm regards,

Lynn R. Goldman, MD, MS, MPH
Michael and Lori Milken Dean
Milken Institute School of Public Health
The George Washington University
Message from Senior Associate Dean for Research and Innovation

Dear Guests and members of the GW community,

Welcome to the GW Milken Institute School of Public Health’s Research Day 2024. I am delighted to host this event and commend our faculty, staff, and students for their outstanding research efforts over the past year.

In our ever-changing world, the importance of public health has reached an unprecedented level, and the Milken Institute School of Public Health has emerged as a distinguished leader in the field. Through groundbreaking research and unwavering dedication, we are driving continuous advancements and new discoveries that will overcome global health challenges for underprivileged populations and shape a healthier and more equitable future for all.

Today's event is an excellent opportunity for attendees to exchange knowledge, keep up with the latest breakthroughs, participate in dynamic discussions, and build valuable connections and collaborations. The research presented here covers a wide range of topics, including defining global health diplomacy in a post-covid era, identifying determinants of fun in tennis to improve health outcomes for individuals with autism spectrum disorder, the relationship between breastfeeding and stunting in children 6-23 months of age in Pakistan, birth weight as a risk factor for type 2 diabetes and gestational diabetes mellitus among South Asian women living in the US, a web-based tool for Sample size and power evaluation for clinical trials using the desirability of outcome ranking and much more.

I want to express my sincere appreciation to all the presenters, judges, sponsors, organizers, and attendees for their unrelenting dedication to seeking knowledge and promoting public health. This event demonstrates our shared determination to push beyond limits and work tirelessly towards building a more equitable and healthier world for everyone.

Finally, I extend my heartfelt thanks to the Office of Research Excellence team (coordinated by Imomotimi and Tien-Chin) and all the staff and volunteers who contributed to making the Milken Institute School of Public Health Research Day 2024 a great success. Your hard work and dedication are truly appreciated.

Sincerely,

Adnan A. Hyder, MD, MPH, PhD
Senior Associate Dean for Research and Innovation
Professor of Global Health
Dear GWSPH Community and Friends,

We are thrilled to welcome you to the GW Milken Institute School of Public Health’s Research Day 2024. This event is a celebration of the phenomenal research and scholarly work of our incredible students, staff and faculty. It is also a reflection of the collaborative, interdisciplinary, innovative, and impactful scholarly opportunities that are a hallmark of the GWSPH experience and critical to the evolving field of public health and the great challenges we are confronting domestically and globally.

The Office of Academic, Student and Faculty Affairs is proud to help advance these exciting research efforts in our community. We are dedicated to supporting students, faculty and staff in their pursuit of academic and research goals that lead to innovative solutions for a healthier planet. We also foster a collaborative and inclusive environment, where students alongside faculty and staff are encouraged to think critically, explore interdisciplinary approaches, and contribute to the greater goal of improving global health outcomes.

We hope you will join us in learning something new, engaging with each other, and promoting the advancement of public health through the wonderful array of topics and posters presented today. To all who are participating, we wish you good luck and continued success in your research and academic endeavors.

Jane Hyatt Thorpe, JD
Sr. Associate Dean for Academic, Student & Faculty Affairs
Professor of Health Policy and Management

Heather Renault
Assistant Dean for Student Services

Monica Partsch
Assistant Dean for Faculty Affairs
Dear Guests and members of the GW community,

On behalf of the Office of PhD/MS programs, we welcome you to Research Day 2024. We are thrilled that so many of our students are participating. Research Day is an incredible opportunity to share with other students and faculty the exciting work that we engage in throughout the year. It offers a time to step back, reflect on progress and interact with others on key ideas motivating the work and on the significance of those findings. And above all, it is a time to enjoy that we are a community devoted to the systematic pursuit of new knowledge to improve public health. I wish you all a wonderful Research Day!

Lorien Abroms, ScD, MA  
Associate Dean for PhD/MS Programs  
Professor of Prevention and Community Health

Dear GWSPH Community,

Welcome to the GW Milken Institute School of Public Health Research Day! Here, we celebrate innovative research produced by undergraduate and graduate students, faculty, staff, and the community. From COVID-19 to childhood obesity, public health researchers respond to today’s greatest challenges.

Our undergraduate students are drawn to GWSPH because of our outstanding faculty, extensive public health programs, and location in Washington, D.C. They work on cutting-edge research and participate in Research Day to hone their skills and prepare for public health careers.

Thank you to the staff and volunteers who made this event possible. Enjoy the GW Milken Institute School of Public Health Research Day!

Sara E. Wilensky, JD, PhD  
Associate Dean for Undergraduate Education  
Associate Teaching Professor, Department of Health Policy and Management
Dear GWSPH Community,

Public Health Research is the foundation on which we strive to make our communities and world safer, cleaner, healthier, and more equitable. At the heart of every research question presented today exists a true desire to understand the truth. As the namesake of our University once penned, I encourage you all to continue to seek that truth and pursue it steadily.

Matthew Barberio, PhD
Lab PI Committee Chair
Assistant Professor of Exercise and Nutrition Sciences

Dear Colleagues,

Welcome to GW Milken Institute School of Public Health Research Day 2024, one of my favorite days of the year!

Today, we have the chance to showcase creativity, hard work, and passion for improving public health through research. This is what makes GWSPH an exceptional place to learn, collaborate, and work. The innovative ideas that we present today are part of the momentum that our community carries forward in all of our efforts to improve public health at the local, national, and global levels.

Research is a transformative experience that helps you grow personally and professionally. It allows you to solve problems, apply new skills, and learn from others. Our hope for this event is that you will take a small step towards becoming a public health pioneer who addresses society's most pressing challenges through research, discovery, collaboration, and inclusivity.

Thank you to all who shared their work and contributed to this event. Your contributions are essential to supporting our research ecosystem.

Emily R. Smith, ScD, MPH
Associate Professor of Global Health & Nutrition Chair, GWSPH Research Committee
### Program
GWSPH Research Day  
April 9, 2024  
The Convening Center  
Milken Institute School of Public Health

<table>
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<tr>
<th>Time</th>
<th>Activity</th>
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<tr>
<td>7:00 am - 11:00 am</td>
<td>Poster Presentation Setup</td>
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<tr>
<td>12:00 pm - 2:00 pm</td>
<td>Judging of Posters</td>
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<tr>
<td>2:00 pm - 3:00 pm</td>
<td>Coffee and Cookies Break</td>
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<td>3:00 pm - 4:00 pm</td>
<td>Awards and Prizes Ceremony</td>
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<td>4:00 pm - 4:30 pm</td>
<td>Poster Removal</td>
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ABSTRACTS BY DEPARTMENT
Biostatistics and Bioinformatics
Infer biological insights from sequencing data using language models

**Background:** Recent advancements in High-Throughput Sequencing (HTS) have enabled more accessible and cost-effective DNA sequencing. Despite this progress, deriving meaningful insights from the vast amounts of generated data remains challenging. Language models have emerged as valuable tools in genomics and metagenomics research, offering new approaches to decipher the genome's language and predict phenotypes from DNA sequences. Despite the computational inefficiencies of traditional methods, the potential of language models in enhancing predictive accuracy and driving progress in this field is significant.

**Methods:** For training and validation, we curated a dataset comprising 19,551 representative genomes sourced from the NCBI database, including 18,268 bacterial, 647 archaeal, 577 fungal, 40 viral, and 1 human reference genome. Byte-pair encoding (BPE) was selected for tokenization. Five distinct tokenizers were trained with vocabulary sizes of 4096, 8192, 16384, 32768, and 65536. Subsequently, three different models based on the DeBERTa-v2 architecture were trained for each tokenizer, with parameter sizes ranging from 15M to 94M. Following model training, benchmarking, and fine-tuning were conducted using low-adaptation rank (LoRA) on a set of 28 downstream tasks on the Genome Understanding Evaluation (GUE) dataset. The performance of our models was then compared against existing state-of-the-art models.

**Results:** Our models were trained on batches consisting of 512 samples for 150,000 steps. In total, they processed approximately 77 million samples, equivalent to 38 billion tokens. Post fine-tuning, our selected models demonstrated superior performance compared to state-of-the-art models across 26 out of 28 downstream tasks.

**Conclusion:** In this study, a combination of training diverse models and fine-tuning them for downstream tasks was employed. Notably, one of our models, despite being only 10% of the size of the DNABERT2 model and approximately 3.5% the size of the NT-Multispecies-v2 model, exhibited remarkable performance. This suggests promising advancements in developing lightweight yet accurate models for future applications. Moreover, the achieved scores on various tasks underscore the potential of language models in accurately predicting phenotypes from DNA sequences, indicating exciting prospects for further research and practical implementations in genomics.
cellSight: Deciphering underlying dynamics of cells and gene expression during injury-induced skin inflammation using single nuclei RNA-sequencing

**Background:** The rapid advancements in sequencing technology have revolutionized transcriptomics analyses, with single-cell RNA sequencing (scRNA-seq) emerging as a cornerstone due to its remarkable throughput. This technique provides extensive data output and intricate microscopic insights, enabling precise identification of underlying biological factors. However, the complexity of subsequent analyses poses challenges in extracting detailed information effectively from the data. To address this, we propose cellSight, an automated workflow implemented as an R package, designed to simplify and streamline scRNA-seq analysis for more efficient exploration of minute details.

**Methods:** cellSight offers comprehensive solutions from filtering and quality control (QC) to differential expression analysis, providing a robust framework for scRNA-seq data processing. Quality control procedures in cellSight rigorously remove low-quality cells based on criteria such as mitochondrial content and unique molecular identifier (UMI) counts, ensuring data integrity. Integration of metrics from the Seurat package ensures compatibility with established single-cell analysis practices, enhancing the reliability of downstream analyses. Normalization in cellSight is performed using the sctransform method, addressing technical noise and biological variability inherent in scRNA-seq data. This approach ensures comparability of expression profiles across cells, improving downstream analysis accuracy and facilitating the identification of differentially expressed genes. The utilization of the Tweedieverse statistical framework enables robust and flexible differential expression analysis, crucial for identifying genes driving cellular diversity with reliable results. Moreover, cellSight integrates the Cellchat package for analyzing cell-cell interactions via ligand-receptor pairs, offering insights into the communication network within a cellular population. This comprehensive approach enhances understanding of complex biological processes, providing valuable insights into cellular communication dynamics.

**Results:** In a case study focused on skin tissue samples, cellSight effectively identified 21 clusters, including various cell types such as fibroblasts, epithelial cells, monocyte/macrophage clusters, endothelial cells, skeletal muscle, adipocytes, and mast cells. Differential expression analysis revealed cytokines and growth factors expressed by different cell types, highlighting the crucial role of fibroblasts in initiating inflammatory responses and tissue repair processes.

**Conclusion:** Our study underscores the importance of fibroblasts during early stages of injury and presents cellSight as a valuable tool for scRNA-seq analysis. By providing a detailed pipeline that significantly reduces the overhead associated with scRNA studies, cellSight empowers researchers to unravel complex biological mechanisms with greater efficiency and accuracy.
Using Masssight To Determine The Functional Metabolomic Profile Of Onset Inflammatory Bowel Disease Patients

**Background:** The Integrative Human Microbiome Program (iHMP) is a multifaceted research project centered on cataloging the functional metabolome of humans and how it changes in response to disease. The Onset of Inflammatory Bowel Diseases (IBD) is a specific subset of this project. This project was conducted at multiple universities and research centers, where each attempted to isolate and categorize how the metabolomic profile changes in individuals as they age, specifically in individuals with IBD. Because of the multi-university dynamic nature of this project, individual data sets will have drift that must be corrected when combining data sets before annotating. MassSight is a computational program that combines individual Liquid Chromatography Mass Spectrometry experiments and adjusts their retention times, mass-to-charge ratios, and intensities. Metaboanalyst is a web-based platform dedicated to comprehensive metabolomics data analysis and interpretation.

**Methods:** Individual data sets from the iHMP project are preprocessed with XCMS, combined with massSight, and analyzed using Metaboanalyst to determine individuals' longitudinal functional metabolic profile in the IBD study. This project aims to profile metabolites, identify and quantify small molecules, and annotate the functional profile of metabolites in patients with inflammatory bowel disease using MassSight and Metaboanalyst.

**Results:** There are no preliminary results to submit as of now.

**Conclusion:** Obtaining dynamic metabolite profiles is important for healthcare as changes in the metabolite profile can indicate disease progression. Understanding the metabolic profile helps to understand and treat the disease because of the comprehensive information about microbiome-metabolites relationships and the wellness of human body systems.
**Enhancing Metabolomics Research through Advanced Data Integration: The Development and Application of massSight**

**Background:** The expanding field of metabolomics plays a crucial role in enhancing our understanding of biological systems and facilitating advancements in areas such as disease diagnostics, personalized medicine, and biotechnology. However, the integration of datasets from diverse sources in untargeted metabolomics studies, facilitated by liquid chromatography-mass spectrometry (LC-MS), is hindered by inherent measurement and batch errors and the lack of a predefined target list. This makes the consistent tracking and identification of metabolites across different time points or study locations particularly challenging.

**Methods:** We introduce “massSight”, an R package developed to address these challenges by employing unsupervised and semi-supervised batch correction methods for aligning and scaling LC-MS data. The package aims to facilitate the combination of LC-MS datasets across different time points, study locations, or sample types by accurately modeling drift effects in retention time (RT), mass to charge ratio (M/Z) and intensity across datasets. Our methods involved the development of statistical models to process and integrate untargeted LC-MS datasets effectively, validated through rigorous comparison against known standards and cross-validation across multiple datasets.

**Results:** Preliminary findings demonstrate that massSight significantly improves the accuracy of combined dataset analysis, effectively mitigating batch variations and enhancing the consistency of metabolite identification across studies. The high level of accuracy in dataset integration supports more reliable metabolomics research and expands the potential for cross-study comparisons and meta-analyses. Additionally, massSight significantly reduces the amount of time required to preprocess increasingly large metabolomics datasets.

**Conclusion:** The development of massSight marks a significant advancement in metabolomics research, addressing critical challenges in data integration and analysis. By improving the reliability and accuracy of metabolite identification across diverse datasets, massSight contributes to the broader application of metabolomics in disease diagnosis, understanding metabolic pathways, and developing personalized medicine strategies. Its implementation underscores the importance of accurate data analysis tools in advancing the field of metabolomics and, by extension, biomedical research.
GWSPH RESEARCH SHOWCASE

BIOSTATISTICS AND BIOINFORMATICS

A Web-based Tool for Sample Size and Power Evaluation for Clinical Trials using the Desirability of Outcome Ranking (DOOR)

The determination of sample size and the evaluation of power are fundamental and critical elements in the design of a clinical trial. If a sample size is too small then important effects may not be detected, while a sample size that is too large is wasteful of resources and unethically puts more participants at risk than necessary.

The Antibacterial Resistance Leadership Group (ARLG) (https://arlg.org/) developed the Desirability of Outcome Ranking (DOOR) methodology, a novel paradigm for the design, conduct, monitoring, analysis, reporting, and interpretation of clinical trials. The DOOR methodology allows researchers and clinicians to effectively evaluate and compare treatment strategies by providing a pragmatic, comprehensive, and informative way to compare the patient-centric risks and benefits of intervention alternatives. The methodology has been implemented in the design, conduct, and analysis of several clinical trials in infectious diseases and other disease areas.

An important first step is to define an ordinal DOOR outcome representing a global patient response considering benefits and harms on the basis of important clinical outcomes (e.g., benefits, harms, and quality of life). DOOR outcomes are compared between two groups using a rank-based method, i.e., pairwise comparisons of individual patient responses, and summarized by the probability that a patient randomly selected from one group has a more desirable DOOR outcome than a patient randomly selected from the other group (this probability is called the “DOOR probability”). The DOOR probability is 50% when DOOR outcome distributions are identical between groups.

We developed a freely-available web-based application (app) using the R package “Shiny” for sample size, power, and precision evaluation in clinical trials comparing two interventions using the DOOR methodology. The app provides a comprehensive tool for power and sample size calculations in clinical trials using: (1) power-based and (2) precision-based methods. The power-based method is based on testing the hypothesis that the DOOR probability is greater than a pre-specified null value (typically chosen as 50%), controlling for the power and Type I error probability. The app calculates the power and sample size for superiority and non-inferiority trials. The precision-based method is designed to control the width of the confidence interval of the DOOR probability estimate at the desired confidence level. The tool reports calculated power/sample size, actual power for a given sample size, and empirical power from a simulation. The tool provides sensitivity analyses including plots of the required sample size as a function of the desired power or as a function of the alternative DOOR probability. We demonstrate the tool using real clinical trials. The tool is freely available online at https://methods.bsc.gwu.edu/.
Validation of a Transcriptomic-Based Machine Learning Model to Establish the Endotype of SLE Patients

**Background:** We previously developed a novel machine learning (ML) pipeline leveraging analysis of whole blood gene expression (GE) data to identify subsets of SLE patients with common molecular patterns of disease, endotypes. These molecular subsets had significant differences in clinical characteristics, frequency of subsequent flares, and clinical responsiveness to therapy. Thus, actionable patient subsets were identified and could be predicted with ML based on GE profiling.

**Purpose:** The current study makes use of the ML classifier to determine endotype membership (out of eight total) in an independent cohort of SLE patients.

**Methods:** GE by RNA-sequencing of whole blood and clinical metadata were collected from 91 SLE patients from two clinical trials (NCT03626311 and NCT03180021). Patients met ACR classification criteria of SLE and patients from one trial had renal biopsies at the time GE was measured. A random forest classifier trained on 2183 lupus patient GE profiles was used to predict endotype membership of the 91 patients. Lupus Cell and Immune Score (LuCIS), a continuous score measuring the extent of modular immunologic abnormalities, was also calculated for each patient.

**Results:** The ML prediction of independent SLE patients into endotypes yielded eight subsets with molecular patterns mirroring those found previously in a development and testing cohort of 3166 patients. Endotypes were designated A-H, with A representing the group with the least number of transcriptional lupus-related aberrancies and H representing the group with the greatest. The distribution of patients in each group varied, with groups B and G comprised of few patients. Endotype H contained the most patients with proliferative nephritis (LN) but no patient with LN was found in subset A or B. Serum complement levels, positivity for anti-double-stranded DNA (anti-dsDNA) antibodies, and the presence of LN differed among the subsets, with the more immunologically active endotypes having lower complement, more nephritis, and greater odds of anti-dsDNA positivity. LuCIS values reflected the immunological activity of the subsets but did not correlate with SLEDAI, although they were weakly, inversely correlated with serum C3 and C4. Eight patients had moderate/severe flares during the six months of the trials, of whom all had elevated LuCIS values at baseline. We found that our novel endotyping pipeline based on transcriptional profiles and ML accurately identified patient endotypes in new datasets with clinical differences.

**Implications:** Endotyping SLE patients based on GE profiles can provide important prognostic information and novel molecular insights in support of personalized management.
Connecting longitudinal desirability of outcome ranking (DOOR) analysis with multivariate survival outcomes

Desirability Of Outcome Ranking (DOOR) methodology accounts for problems that conventional benefit:risk analysis in clinical trials ignore, such as competing risks and correlation between efficacy and toxicity. Levels of DOOR can be considered as a multistate process in nature, as event-free survival and survival with side effects are not equivalent and the overall patient trajectory requires recognition. In monotone settings like cardiovascular disease or oncology, where patients’ conditions can only get worse, we can record event times for each transition from one level of the DOOR to another, and construct pseudo-Kaplan-Meier curves displaying transition times. While traditional survival analysis methods such as the Cox model require assumptions such as proportional odds and suffer from the interpretation challenge of hazard ratio, Restricted Mean Survival Time (RMST) offers an alternative with greater intuitiveness. Therefore, we propose a combination of the two domains to develop estimation and inferential procedures that could benefit from the advantages of both DOOR and RMST. Particularly, the area under each survival curve restricted to a timepoint, or the RMST, has clear clinical meanings, from expected event-free survival time, expected survival time with at most one of the events, to expected life time before death. We show that the nonparametric estimator of the RMSTs asymptotically follows a multivariate Gaussian process through the martingale theory and functional delta method. With this theoretical result, one can conduct hypothesis testing in many different ways, and recognize when patients transition into worse states. We evaluate our proposed method with data simulated from various scenarios under a multistate model, including when the null hypothesis is true, when the treatment difference exists only in certain DOOR levels, and small-sample studies. A real-world data analysis on a Covid-19 trial will also be presented.
How far is longitudinal omics data analysis from recent statistical models?

Background: Wherever a study is conducted to trace treatment efficiency or to discriminate biomarkers of staged diseases it is usually inevitable to design a longitudinal study on a cohort. While most statistical models for longitudinal data have been developed using clinical data, the high dimensionality and variability of omics data have been less considered in omics studies.

Method: To measure the disparity between existing statistical models and those currently used for longitudinal omics data, we carefully reviewed 166 articles by now covering various omics longitudinal data, ranging from biomarkers to multiomics. The collected methods range from naïve regression of omics features individually onto metadata to more technical methods such as regularized mixed-effect splines and Bayesian nonparametric regression.

Results: This study clearly shows the gap between the statistical theoretic methods and the current requirements of longitudinal omics studies. The main statistical obstacles in longitudinal omics cohorts are categorized as: 1- Unbalanced samples: Sampling with constant time lags or even same number of replicates for all the subjects is not realistic, 2- Correlated omics feature: Although the multivariate methods have been widely developed, the researchers still would rather to use multiple use of univariate methods instead of considering the correlation between the omics features, 3- Time-varying metadata: While random covariates may not change estimated coefficients from a predictive standpoint, they impact the estimation of variance, thereby questioning the accuracy of resulting p-values and false discovery rate (FDR) thresholds, 4- Nonlinearity: The coefficient of determination is also interpretable when the underlying model is linear and ignoring the nonlinearity source can make bias in the long-term predictions, and 5-Joint-modelling: Neglecting the time of event (recovery or mortality) in the sever diseases studies for instance may tend to report misleading biomarkers. The reviewed studies will be categorized both by method and type of data simultaneously, and their consideration of these obstacles will be assessed. The provided summary table of thumb rules assists researchers in selecting appropriate methods to address their scientific questions based on their own longitudinal omics data.

Conclusion: Longitudinal omics studies have predominantly utilized the simple generalized linear mixed models to measure the effect of covariates and differential expression analysis. More complex statistical approaches are often less favored due to challenges in implementing reproducible code and limited flexibility in adjusting assumptions. However, employing advanced statistical models tends to yield more substantial insights into scientific inquiries.
Intention-to-Diagnose: the Principle, Incomplete Data, Sensitivity Analysis, and Online Analysis Tool

**Background:** In randomized clinical trials, intention-to-treatment (ITT) principle stating to include all the randomized participants regardless of events happening post-randomization such as noncompliance, protocol deviations, withdrawal, etc., protects the trial integrity. The intention-to-diagnose (ITD) principle, an analog to the ITT principle in diagnostic studies provides the same protection, through valid statistical inference (e.g. precise error control during hypothesis testing and correct coverage probabilities for confidence intervals (CI) of the test accuracy measurements such as sensitivity and specificity) and well-defined population from which to estimate parameters and generalize results. Adherence to the ITD principle requires accurately recognizing, correctly interpreting, and properly handling non-positive non-negative (NPNN) results such as “equivocal” and “invalid”. The three research foci on testing accuracy i.e., pragmatic application accuracy, pragmatic scientific accuracy, and explanatory scientific accuracy, determinates the selection of analysis set and the handling of NPNN results. A software is needed to evaluate the investigational test following the ITD principle.

**Objectives:** To demonstrate the ITD principle, provide methods to handle incomplete data and conduct sensitivity analysis, and develop and illustrate a freely-available online app as analysis tool

**Methods:** By approximately handling the NPNN results based on different research foci, the statistical analyses consist of outputting (1) a forest plot of point estimate and CI estimates of the accuracy measurements including sensitivity, cumulative sensitivity, specificity, and cumulative specificity, for each research foci; (2) a range analysis plot of each accuracy measurement for the explanatory scientific accuracy; (3) the point estimates and CI estimates of test accuracies by three simple imputation methods including worst scenario case (WSC), non-information (NI) imputation, and imputation by disease status, to address the explanatory scientific accuracy; (4) plots of predictive values with confidence bands as a function of prevalence for each research foci; and (5) the point estimates and CI estimates of predictive values at a certain prevalence for each research foci. The CI estimates will be calculated with methods of Agresti-Coull, Wilson Score, and Wilson score with continuity correction.

**Results:** A freely-available online R Shiny App was developed to implement the statistical analyses. Application of the online tool was illustrated using an example evaluating a diagnostic test for tuberculosis.

**Conclusion:** In parallel to the ITT principle, ITD principle provides greater test integrity, more accurate result interpretation, and further, better clinical application. The online shiny app provides a simple freely-available tool to comprehensively evaluate a diagnostic test with commitment of the ITD principle.
Meta-analysis of the gut microbiota in response to cancer Immunotherapy in melanoma

**Background:** This research addresses the challenge of melanoma, a notably aggressive cancer with a propensity for metastasis. Traditional treatments, surgery, chemotherapy, and radiation have limited success, especially in advanced stages. Recent breakthroughs in immunotherapy, particularly immune checkpoint inhibitors (ICIs) like anti-PD-1 and anti-CTLA-4, have marked a significant advancement in melanoma treatment. These therapies enhance the immune system’s ability to target and eliminate cancer cells, though patient responses vary, underscoring the need for personalized treatment approaches.

**Methods:** Our meta-analysis synthesizes data from seven clinical trials, including 678 samples. This comprehensive approach addresses common oncological research challenges such as small sample sizes and study design heterogeneity. Notably, studies indicate a complex relationship between the gut microbiome and ICI response, with certain microbial taxa linked to positive outcomes.

The methodology adhered to RECIST v1.1 criteria for response assessment, utilizing metagenomic data from multiple datasets. Rigorous quality control was employed, including data processing through KneadData and MetaPhlAn for taxonomic profiling, and seqSight for biosynthetic gene clusters (BGC) analysis. Batch effects were corrected using ConQuR and MMUPHiN packages.

**Results:** Preliminary findings reveal a complex yet significant correlation between gut microbiome composition and ICI response in melanoma patients. Microbial taxa like *B. stercoris* and *B. xylanisolvens* and BGCs like *BGC0000090* and *BGC0000972* correlate with positive treatment responses, but this link is nuanced and influenced by various factors. Our study encountered limitations in establishing consistent microbial associations across different cohorts.

**Conclusion:** In conclusion, our research underscores the intricate relationship between the microbiome and melanoma treatment responses, highlighting the potential for more tailored and effective immunotherapy strategies. Further studies with larger, diverse cohorts are essential to deepen our understanding of this interaction.
Environmental and Occupational Health
Impact of Wildfire Smoke Exposure on Mental Health of Adults: A Systematic Literature Review

Background: Wildfires have increased in frequency due to climate change leading to associated health risks. The total impact of wildfires on mental illness has yet to be evaluated, however evidence shows correlation between exposure to wildfire smoke and outcomes relating to mental health effects.

Objective: I aimed to determine how exposure to wildfire smoke affects mental health in adult humans.

Methods: A search was conducted through PubMed, Scopus, ProQuest, GreenFILE, and Web of Science for peer-reviewed articles relating to my exposure and outcome. I used Navigation Guide methodology to assess studies for risk of bias, quality, and strength of evidence.

Results: A total of 9 studies of the 564 screened were included in the final review. Of these 9 studies, 5 of the studies measured the general outcome of mental health, 4 measured more specific outcomes relating to mental health such as suicide, anxiety, depression, etc., and one measured attention span as an indicator of mental health. A total of 5 studies found a positive association, one found a negative association, 2 found no association, and one found both positive and negative associations between exposure and outcome.

Discussion: This review was the first to systematically review my exposure and outcome and found low quality and inadequate evidence for association between wildfire smoke and mental health. Most of the reviewed studies were quantitative, population-based, and in high-income countries, however future research should focus on more robust epidemiological studies measuring smoke specific to wildfire as opposed to overall air pollution.
Exposure to Major Hurricanes and Trends of Suicidality in US Adults: A Systematic Review

Background: Increases of negative mental health outcomes such as PTSD and depression have been observed following a hurricane, but no major conclusion on suicidality trends have been drawn. Hurricanes are becoming more frequent and powerful due to climate change, and can be traumatic experiences that can cause, or exacerbate, mental illnesses.

Objectives: We aimed to address the question: how does experiencing a major hurricane impact suicidality trends in the US compared to those who do not experience a major hurricane?

Methods: The databases PubMed, Web of Science, and Scopus were searched. Covidence was used to screen papers, then the risk of biases, quality, and strength were rated using methods outlined by the Navigation Guide.

Results: After the screening process, eleven unique studies were left to be reviewed. The overall risk of bias was “probably low,” but the domains confounding and blinding had the highest risk of bias. The overall quality was rated “low,” and the strength was rated as “inadequate.” A weak association is broadly observed; however, the inadequate body of evidence constrains us from drawing a stronger conclusion.

Discussion: There was substantial variability in the studies, as each paper studied different hurricanes. Many studies were low quality with many limitations due to the difficult nature of studying natural disasters. While there is insufficient evidence to conclude that hurricanes cause higher amounts of suicidality, precautionary measures can be taken. Mental health support for all mental illnesses, including suicidality, should be integral to hurricane response.
Green Space Exposure and its Association with Stress among Older Adults: A Systematic Review

Background & Significance

Stress is a common condition with known adverse physical and mental health effects, and how we manage stress plays a crucial role in mitigating those effects. Green space has been shown to reduce stress and its related health consequences, improving individual and population health outcomes. As our global population shifts toward older adults, the well-being of this population becomes increasingly critical.

Purpose

This systematic review aims to examine the potential association between green space exposure and stress outcomes among older adults, a population less studied on this subject. Using the Navigation Guide, we conducted a systematic review analyzing the association between green space exposure and stress among older adults, ages 55 years and over. We assessed the quality and strength of evidence through peer reviewed literature.

Methods

We searched several databases to conduct a literature review and used the Navigation Guide methodology. We selected inclusion and exclusion criteria to identify qualifying studies. Then, we assessed each study’s risk of bias across several domains.

Findings & Conclusions

Eight studies fit our inclusion and exclusion criteria. Each study analyzed the relationship between green space and stress among older adults. Our methodology led to the selection of a diverse body of evidence that varied by many factors, including location, population size, exposure and outcome measurement, and study design.

After conducting this systematic review, we conclude that there is limited evidence of association between exposure to green space and reduced stress among older adults. More research is needed specific to the older adults target population.

Implications of the Findings

Due to limitations of our analysis, further reviews should be conducted, but this systematic review points to evidence that stress outcomes may be reduced with increased exposure to green space in older adults.
Tree Canopy Coverage as an Effective Mitigator of the Heat Island Effect in Urban Areas Systematic Review

**Background:** The heat island effect refers to the larger issue of global temperatures rising and city landscapes experiencing higher temperatures caused by the built environment. I conducted a systematic review to assess the literature on tree canopy coverage and the heat island effect relationship. Using the Navigation Guide systematic review methodology, I evaluated the available literature to answer the question, “Does urban tree canopy act as an effective mitigator of the heat island effect?” and evaluated the studies reviewed.

**Methods:** Following the Navigation Guide’s approach, I searched through two databases and selected studies based on my SECO statement. Analysis of studies was conducted looking at risk of bias in each study, and the quality and strength of evidence across studies.

**Results:** I identified six studies, that met my inclusion criteria. I compared the exposure, tree canopy coverage, to the outcome, temperature, and found that there was little association between the exposure and outcome. While the studies showed some evidence for association, they did not account for bias or confounding and as a result, were rated low for strength of evidence, (-2) for quality of evidence, and high for risk of bias.

**Conclusion:** Based on the Navigation Guides criteria, the evidence suggests there is “inadequate” evidence of the association between tree canopy coverage and temperature.
Lung Function Measures and Self-Reported Respiratory Symptoms in Association with Occupational Exposure to Cooking: A Systematic Review

**Background:** Cooking is a common occupation worldwide and the process of cooking can emit many substances that are associated with adverse health effects, including respiratory effects. A systematic review was conducted following the Navigation Guide systematic review methodology to evaluate the available literature to answer the question, “Is occupational exposure to cooking associated with respiratory symptoms or lung function?”

**Methods:** The steps of the Navigation Guide were used to find relevant literature to answer the study question. Three databases were searched, and relevant studies were evaluated for risk of bias, quality, and strength of the evidence.

**Results:** A total of eight studies addressed the PECO statement and were not excluded through the application of the exclusion criteria. Four studies measured the prevalence of self-reported respiratory symptoms, two studies measured lung function via spirometer, and two studies measured both. Study quality was downgraded for being indirect and upgraded for showing a large magnitude of effect, making the quality of the evidence moderate overall. The direction and confidence in the effect estimate was high. The available literature is considered to be of sufficient strength.

**Conclusions:** Through the application of the Navigation Guide’s systematic review methodology, it was concluded that there was “sufficient” evidence of there being a significant association of increased respiratory symptoms and decreased lung function with occupational exposure to cooking.
Prenatal Exposure to PFAS and Cognitive Development Outcomes in Children: A Systematic Review

**Background:** PFAS are synthetic compounds widely used in household and personal care products, and their environmental persistence has led to widespread exposure. PFAS can cross the placenta, thus resulting in the potential for exposure to begin in utero. This systematic review explores the relationship between prenatal exposure to PFAS, specifically PFOA, PFOS, PFHxS, and PFNA, and cognitive development assessment outcomes in children quantified using FSIQ scores.

**Methods:** The author searched three databases using keywords relating to the PECO statement. Studies deemed relevant went through a title and abstract screening. The remaining references underwent a full-text screening. The articles included meet the following criteria: are original data articles assessing cognitive development using WISC or WPPSI, measure prenatal PFAS exposure with maternal serum concentration, and use FSIQ measurements from children between the ages of 3 and 8 years. The authors conducted a risk of bias assessment and extracted data to rate the strength and quality of evidence across the literature.

**Results:** The systematic review includes seven studies. The strength and quality of the evidence are moderate, with the overall bias relatively low. The results are inconsistent, and confounding is found to minimize effect. There is insufficient evidence of toxicity. The relationship between prenatal PFAS exposure and FSIQ scores is conflicting.

**Conclusions:** The effects of PFAS exposure on cognitive development during pregnancy are unclear. Therefore, the continued use and production of PFAS may pose uncertain risks. Further research is necessary to investigate the relationship between prenatal PFAS exposure and the outcomes of childhood cognitive development.
Residential Access to Green Space and Childhood Obesity: A Systematic Review from 2018-2023

We conducted a systematic literature review regarding the association between residential access to green spaces and childhood obesity.

We searched five relevant databases for articles published between 2018-Present (2023). Original studies focused on residential access to green space and its association with childhood obesity were included. We evaluated the risk of bias in the studies and the overall quality and strength of the evidence according to the Navigation Guide methodology.

Nine studies were included in the analysis. The quality of evidence was rated moderate and the strength of the body of evidence was rated limited. The included studies either indicated that increased access to green space was associated with lower childhood obesity or found no association. The studies exhibited small magnitudes of effect and notable risks of biases.

We concluded that there is limited evidence supporting an association between residential access to green space and childhood obesity. Access to residential green space may help mitigate childhood obesity, but further focused studies that isolate this connection are necessary to improve understanding.
Urban areas are a key contributor to global climate change and air pollution. Currently, urban areas—comprising over half of the global population—face increasing public health challenges attributable to environmental and climate hazards. Various worldwide urban initiatives have been implemented to address the health threats arising from air pollution and climate change, for example, setting sustainable development goals and forming global city networks to address climate change through collaborative actions. Nonetheless, there is still substantial uncertainty regarding the effectiveness and benefits of these actions in relation to both air pollution and greenhouse gas (GHG) emissions. This study identifies and compares temporal trends of CO2 emissions and air pollutant (PM2.5, NO2, and O3) concentrations across 13,000 cities worldwide from 2000 to 2021. We aggregate gridded estimates of CO2 emissions and pollutant concentrations to urban areas with newly available datasets based on satellite data, geophysical modeling, and statistical approaches. We also explore the influence of different commonly used urban boundary definitions on estimated air pollution concentrations and CO2 emissions. Results from this study provide the first city-scale systematic comparison of temporal trends in CO2 emissions and three health-damaging and ubiquitous air pollutants encompassing all urban areas globally. We expect our results will allow international, national, and sub-national actors to evaluate progress towards GHG and air quality targets and further develop long-term mitigation strategies.
The Association Between Maternal Exposures to Disinfection Byproducts and Risks of Developmental Birth Defects

Background and Significance: Previous research has raised concern that maternal exposures to disinfection byproducts (DBPs) during the first trimester of pregnancy may lead to adverse health outcomes. Prior animal studies have found that pregnant mice exposed to DBPs experienced adverse birth outcomes including developmental birth defects. Recent human studies have also found that some common DBPs have endocrine-disrupting properties, and because the endocrine system plays a large role in fetal development, this provides biological plausibility for the relationship between maternal DBP exposures and birth defects. Because human birth defects affect about 3% of all babies born in the U.S. each year, and are the leading cause of infant deaths, it is critical to research possible causes.

Purpose: This systematic review intends to characterize associations between maternal exposures to DBPs and risks of developmental birth defects using studies published in the last five years (2018-2023). The DBPs focused on in the studies include trihalomethanes (THMs) and haloacetic acids (HAAs), among others, that are monitored by public water systems in the U.S. and Sweden. Seven categories of birth defects are reviewed, including obstructive genitourinary defects (OGDs), congenital malformations, hypospadias, musculoskeletal defects (MSDs), orofacial cleft (OFC) development, craniofacial birth defects (CFDs), and cardiac birth defects.

Methods: Following the Navigation Guide framework, databases were searched for studies published in the designated time frame that met the predefined inclusion and exclusion criteria. Identified studies were scored individually for risk of bias and all studies were appraised for overall quality and strength of evidence ratings.

Results and Conclusion: Inconsistent results were found among the seven studies that reviewed maternal DBP exposures and risks of birth defects. While some studies found an inverse relationship between DBP exposure and birth defect risk, other studies found both elevated and statistically significant risks of birth defects from maternal exposures to DBPs. Studies that comprehensively account for the complexity of relationships between maternal DBP exposures and birth defects are limited. Due to the potential risk for misclassification in exposure assessments and possible confounding variables, the quality of evidence was deemed low and strength of evidence of toxicity is limited.

Implications of Findings: Despite the limited quality and strength of evidence, pregnant individuals may be advised to avoid exposure to DBPs during their first trimester of pregnancy, as health outcomes are unknown and numerous DBPs are currently classified as “probable,” or “possible human carcinogens” according to the U.S. Environmental Protection Agency. This review indicates that further research is needed to characterize risks of maternal exposures to DBPs more thoroughly. Future studies should continue to investigate the toxicology of known and regulated DBPs, in addition to unregulated DBPs, on human health.
Tracking progress towards urban nature targets using landcover and vegetation indices: A global study for the 96 C40 Cities

**Background:** Access to urban natural space, including blue and greenspace, is associated with improved health. In 2021, the C40 Cities Climate Leadership Group set 2030 Urban Nature Declaration (UND) targets: “Quality Total Cover” (30% green area within each city) and “Equitable Spatial Distribution” (70% of the population living close to natural space).

**Objective:** We evaluate progress towards these targets in the 96 C40 cities using globally available, high-resolution datasets for landcover and normalized difference vegetation index (NDVI).

**Methods:** We use the European Space Agency (ESA)’s WorldCover dataset to define greenspace with discrete landcover categories and ESA’s Sentinel-2A to calculate NDVI, adding the ‘open water’ landcover category to characterize total natural space. We compare 2020 levels of urban green and natural space to the two UND targets and predict the city-specific NDVI level consistent with the UND targets using linear regressions.

**Results:** The 96-city mean NDVI was 0.538 (range: 0.148, 0.739). Most (80%) cities meet the Quality Total Cover target, and nearly half (47%) meet the Equitable Spatial Distribution target. Landcover-measured greenspace and total natural space were strong (mean $R^2 = 0.826$) and moderate (mean $R^2=0.597$) predictors of NDVI and our NDVI-based natural space proximity measure, respectively. The 96-city mean predicted NDVI value of meeting the UND targets was 0.478 (range: 0.352-0.565) for Quality Total Cover and 0.660 (range: 0.498-0.767) for Equitable Spatial Distribution.

**Significance:** Our translation of the area- and access-based metrics common in urban natural space targets into the NDVI metric used in epidemiology allows for quantifying the health benefits of achieving such targets.
The Effect of Exposure to Indoor-Volatile Organic Compounds on Birth Outcomes: A Systematic Review

Background: Prenatal exposure to indoor air pollution has been shown to pose significant risks to the developing fetus in existing studies.

Objectives: The objective of this review was to answer the question of whether indoor sources of volatile organic compounds have an association with adverse birth including outcomes low birth weight (LBW), term low birth weight (TLBW), birth height/length (BH/BL), small head circumference (SHC), small for gestational age (SGA), and prematurity (PMB).

Methods: Literature that examined the effects of volatile organic compounds, or their sources, on adverse birth outcomes was searched for on PubMed, Scopus, and Web of Science. A total of 764 unique studies were identified and filtered for relevance. Six studies were evaluated. Navigation guide methodology was used to evaluate the risk of bias, strength, and quality of evidence from these studies.

Results: Nine household exposures were identified in the six studies and evaluated for possible associations. Modest effect estimates, were found for TLBLW, but other outcomes had limited or inadequate evidence that did not answer the research question. Exposures besides indoor insecticide use and secondhand smoke (SHS) yielded limited consistent evidence across studies.

Conclusion: A conclusion about VOCs and birth outcomes cannot be made with the literature available. This review calls for more robust research methods that use biomonitoring data and exposure assessment. However, the health effects of indoor pollutants cannot be ruled out, and should continue to be regulated to protect the health and safety of our most vulnerable populations.
GWSPH RESEARCH SHOWCASE
ENVIRONMENTAL AND OCCUPATIONAL HEALTH

Stability of Penile Bacteria Associated with HIV Seroconversion, Inflammation, and Cells (BASICs)

Background. Studies have defined specific penile anaerobic bacteria associated with HIV Seroconversion, Inflammation, and immune Cells (BASICs) in uncircumcised men. However, little is known regarding the colonization dynamics of BASICs in the coronal sulcus, or if they colonize other male genital tract sites outside of the coronal sulcus.

Methods. Swabs from 97 uncircumcised men were collected at the coronal sulcus, outer foreskin, penis shaft, and distal urethra in a cross-sectional study in Rakai, Uganda; 47 participants were then sampled longitudinally over 8 weeks. We characterized the penile microbiome and determined three key BASICs (Prevotella bivia, Peptostreptococcus anaerobius, and Dialister micraerophilus) prevalence, proportional and absolute abundance by 16S rRNA qPCR and V3V4 amplicon sequencing. We compared overall microbiome composition by PerMANOVA and BASIC abundances between sites by pair-wise Mann-Whitney Test. We also compared stability of BASICs in the coronal sulcus to other penile commensal bacteria using residence and return times, which measure the time between disappearance and subsequent re-emergence of a taxon, respectively. We imputed abundance thresholds associated with increased HIV seroconversion risk for P. bivia, P. anaerobius, and D. micraerophilus using published data (Prodger et al., 2021) to characterize dynamics of BASICs abundance over the 8-week study.

Results. Overall microbiome composition differed significantly across penile sites, with BASICs most prevalent and abundant in the coronal sulcus as compared to other sites. In most study participants, P. bivia, P. anaerobius, and D. micraerophilus were detected at least once over the 8-week study period (62%, 70%, 64%, respectively), but fewer participants were colonized at all visits (17%, 17%, and 9% respectively). All BASICs had shorter residence times in the coronal sulcus than Corynebacterium, a ubiquitous skin-associated bacterium, and 43% of participants had at least one visit with a BASIC above the high-risk abundance threshold.

Conclusions. BASICs were detectable in the coronal sulcus of nearly two-thirds of uncircumcised participants over an 8-week study period, although only 9-17% of individuals were persistently colonized by a single BASIC species. High abundance colonization by BASICs is transient and uncommon. Targeted interventions to reduce BASIC abundance in the coronal sulcus may be an effective approach to decrease HIV risk.

Primary Presenter
Sydney Nelson

Status
Research Staff

Authors
Sydney Nelson
Ronald M Galiwango
Daniel E Park
Sanja Huibner
Abigail Onos
Maliha Aziz
Edward Sung
Aggrey Anok
James Nnamutete
John Bosco Wasswa
Godfrey Kigozi
Aaron AR Tobian
Jessica L Prodger
Rupert Kaul
Cindy M Liu

Research Mentor/Department Chair
Cindy M Liu
Exposure of Subsistence Farmers to Agrochemicals and Neurological Health Outcomes: A Systematic Review

**Background:** Agricultural chemicals are crucial to many modern farming operations. Subsistence farmers are vulnerable to increased exposure due to lack of regulations and knowledge around safe chemical practices. Studies of agricultural workers have found associations between chronic exposures to agrochemicals and decreased neurological function, but fewer studies focus on subsistence farmers specifically.

**Objectives:** This study aimed to assess the existing body of evidence on the association between agrochemical exposure and neurological health outcomes among subsistence farmers.

**Methods:** The Navigation Guide systematic review methodology was used to specify a study question, select evidence, and rate the quality and strength of evidence. The question assessed was “What are the neurological health outcomes associated with agrochemical exposure of smallholder farmers compared to those who are less exposed?” Inclusion criteria and keywords were developed to identify relevant studies from PubMed and Scopus. 394 articles were initially screened based on titles and abstracts. 37 full text articles were assessed for eligibility and eight were evaluated for quality and strength of evidence.

**Results:** Eight studies were identified that met the inclusion criteria. The quality of the body of evidence was downgraded due to substantial risk of bias. The strength of evidence was assessed as limited evidence of toxicity.

**Discussion:** The associations within the observed literature are consistent with one another but are limited in their strength due to risk of bias. More research is needed to better understand the relationship between agrochemical exposure and neurological health outcomes.
Impact of a chemical acaricide to control tick density in the United States: A Systematic Review

*Background & Objective:* Application of a chemical acaricide is frequently used to control the tick population in a given area (Basu et al., 2017). The most commonly used acaricides include lactones, pyrethroids, carbamates and organophosphates (Basu et al., 2017). The best way to kill ticks is to kill them while they are feeding on a host (such as deer) using an intervention such as the 4-Poster method, which will be discussed in the studies below. The objective is to conduct a systematic review to answer the question “whether using a chemical acaricide intervention is impactful in the reduction of ticks in the United States?”

*Methods:* Inclusion and exclusion criteria were used by referencing the Navigation Guide (Johnson et al., 2014). Peer reviewed articles for this systematic review were obtained by searching PubMed, Scopus, ProQuest and Web of Science. The articles were assessed for risk of bias, quality and strength of evidence, study design and outcomes.

*Discussion:* After applying the inclusion and exclusion criteria, six articles met the criteria out of 485 articles originally screened. Five studies were field studies and one was a randomized control study. The articles focused on reducing the tick density in a given area by using acaricides. All six articles showed a reduction in tick density of about 40-60%. A limitation that can be observed is tick resistance that can be built up over the years when using acaricides. Also reductions in tick density may not always lead to a reduction in tick-borne diseases. The use of acaricides across large areas can also get expensive which may curtail its use.

*Conclusion:* After careful review, evidence proved that acaricide and the 4-Poster method on deer was an effective intervention to be used in the reduction of ticks. However, more studies need to be evaluated for how consistent this intervention is, and whether it loses effectiveness over the years with tick resistance.
Evaluating the Effect of an Urgent Care Antibiotic Stewardship Intervention: A Multi-Network Collaborative Effort

**Background:** Urgent care centers (UCCs) have been reported as having the highest rates of inappropriate antibiotic prescribing. Prior antibiotic stewardship efforts in the urgent care setting have generally been limited to pediatric clinics and diagnoses, or conducted within single urgent care networks. Broadly generalizable stewardship efforts targeting common diagnoses across all ages, such as bronchitis and viral illnesses, are needed in urgent care settings. This study aims to examine the effectiveness of an antibiotic stewardship intervention on reducing inappropriate prescribing for bronchitis and viral illness diagnoses in UCCs as part of a multi-network national collaborative.

**Methods:** This quality improvement study compared inappropriate antibiotic prescribing rates in UCCs after introduction of an antibiotic stewardship intervention, with a 3-month baseline and a 9-month intervention period. The intervention was implemented at 49 UCCs in 27 different networks across 18 states within the United States, including one teledicine site. Participants were urgent care providers from a national collaborative of UCCs. Stewardship interventions included signing of a commitment statement, and a choice of 5 different intervention options to implement during two plan-do-study-act (PDSA) cycles during the intervention period. The primary outcome was the percent of urgent care encounters (from randomly selected patient charts) for viral illness or bronchitis diagnoses with inappropriate antibiotic prescribing, stratified by whether the provider was a direct participant in the quality improvement study and secondarily, by diagnosis. Baseline and intervention periods were compared using an interrupted time series with a generalized estimating equation model. The GWU IRB determined this quality improvement study was exempt (NCR224504).

**Results:** The study included 15,588 patient encounters with a diagnosis of either bronchitis or viral illness. The intervention was associated with a 39% decrease in inappropriate antibiotic prescribing (aOR=0.61, 95% C 0.48-0.77) among participating providers compared to baseline. The intervention did not result in a significant change in inappropriate antibiotic prescribing (aOR=1.08, p=0.54) for providers who were not directly participating in the study.

**Conclusion:** This antibiotic stewardship intervention was associated with large reductions in inappropriate prescribing among providers who directly participated. Implementing stewardship interventions in UCCs may reduce inappropriate antibiotic prescriptions for common diagnoses; however, direct provider participation may be necessary, especially in settings with high rates of provider turnover.
Assessing the Impact of Industrial Presence on Genital Birth Defects in Mexico

Background & Significance: Recognizing the potential health risks for populations in industrial areas is crucial, especially for vulnerable groups. However, there is limited research on birth defects in communities with significant industrial activity.

Purpose: This study seeks to examine the relationship between the density of specific industrial sectors and the occurrence of genital birth defects (GBD) in Mexican municipalities.

Methods: Nationwide official records of genital birth defect incidence spanning twelve years from 2,447 Mexican municipalities were obtained, along with official data on contaminant-emitting industrial plants. Additionally, data on socioeconomic status, access to healthcare, food, and household services were integrated into the dataset. The analysis focused on assessing industrial plant density for sectors such as chemical, petrochemical, automotive, metals, and plastics industries. Negative binomial regressions were conducted, controlling for variables such as access to healthcare, food, and household services. Furthermore, a sub-analysis was performed specifically for lead-emitting industries to examine their potential impact on genital birth defect rates.

Findings & Conclusions: Municipalities with five or more contaminant-emitting industrial plants exhibited higher incidence rate ratios (IRRs) for genital birth defects compared to those with less industrial activity (IRR: 1.22, 95% CI: 1.06 - 1.41, p = 0.01). The presence of three or more petrochemical industrial plants was associated with a substantial increase in genital birth defect rates (IRR: 1.38, 95% CI: 1.11 - 1.72, p = 0.00). Additionally, municipalities where the plastics industry was present demonstrated elevated risks (IRR: 1.29, 95% CI: 1.02 - 1.57, p = 0.025). The chemical industry displayed a significant risk impact in municipalities with at least one industrial plant (IRR: 1.16, 95% CI: 1.01 - 1.34, p = 0.04). The specific analysis for lead-emitting industrial plants showed excess risk even with a single industrial plant present (IRR: 1.23, 95% CI: 1.11 - 1.38, p < 0.00). No significant associations were found with the automotive or metallurgic industries.

Implications: These findings highlight the crucial need to assess public health impacts from industrialized areas for sustainable industrial policy making. Further research is needed to understand these associations exploring occupational exposures and determining emission profiles in the affected areas. Understanding how industrial presence affects surrounding communities is essential for proposing effective policies to protect them. This research provides new evidence of the potential impact of current conditions of Mexican industries on surrounding communities, emphasizing the need to raise awareness and concern among both the communities and authorities to protect them.
Occupational Exposure to Pesticides and Parkinson’s Disease: A Systematic Review

**Background:** The cause of Parkinson’s disease is unknown; however, prior research has explored both genetic and environmental risk factors. Researchers have since built up a body of evidence that suggests an association between occupational exposure to pesticides and Parkinson’s disease.

**Objectives:** This systematic review was conducted to explore the hypothesis that occupational exposure to pesticides is associated with Parkinson’s disease.

**Methods:** Using the Navigation Guide Systematic Review methodology, a literature search was conducted using PubMed, Web of Science, Scopus and ProQuest Environmental Science Collection databases. Of the 954 unique studies, 15 studies met the inclusion criteria and were assessed for risk of bias, quality of evidence and strength of evidence.

**Conclusion:** The majority of the studies (73.3%) found that occupational exposure to pesticides was either associated or significantly associated with a diagnosis of Parkinson’s disease. The assessment of risk of bias, quality, and strength of evidence in the study involved evaluating 15 studies across eight domains. These domains were rated based on factors such as recruitment, blinding, confounding, exposure assessment, outcome assessment, incomplete outcome data, selective outcome reporting, and conflict of interest, with each study producing varying ratings. The quality of evidence was downgraded due to potential bias in exposure measurement but upgraded for consistent findings in the dose-response relationship. Despite moderate ratings for the quality of the body of evidence and direction of effect estimates, the overall strength of evidence was considered limited, suggesting a generic association between pesticide exposure and Parkinson’s disease but not enough to definitively establish a causal relationship.

**Discussion:** The findings have implications for worldwide regulatory treatment of pesticides, as occupational exposure is associated with an adverse health outcome in Parkinson’s disease. Further research into specific pesticide classes and their associations with Parkinson’s disease development is merited.
Investigating the Relationship Between Exposure to Micro- and Nano-Plastics and Oxidative Stress in Goldfish: A Systematic Review

Background & Significance of the Study: While the pollution of plastics is widely accepted as a threat to the environment, there is now growing concern about the effects of pervasive nano- and micro-plastics on animal and human health. Approximately 4 to 12 million tons of microplastics, commonly defined as plastic fragments less than 5 mm in size, are released into seas and oceans each year. Nano-plastics are defined as particles less than 1 μm. While there is evidence of the physical threat plastic pollution poses to wildlife, the physiological fate and biological mechanisms, such as oxidative stress, of nano- and micro-plastic exposure health risks are not fully understood.

The Purpose of Research: This review sought to analyze available literature on the effects of nano- and micro-plastic exposure on oxidative stress within the population of Carassius auratus, goldfish via the biomarkers of superoxide dismutase (SOD) and catalase (CAT) enzyme function.

Methods: Searches were conducted in eight different research databases and produced a total of 345 articles. After the screening process was completed, three eligible studies were identified using inclusion criteria and underwent analysis using the Navigation Guide and SYRCLE tool of risk of bias. The GRADE method was used to assess the quality of evidence of selected studies.

Findings & Conclusions: The major findings of this study were that the overall quality of evidence was moderate due to inconsistent findings across studies for CAT function, and a dose response relationship which emerged between SOD activity and expression and exposure to microplastics. The overall rating of strength for this systematic review was classified as inadequate evidence of toxicity as the limited number of studies analyzed was insufficient and the available evidence from the studies was limited.

Implications and Significance: While there was moderate evidence of an association between nano- and micro-plastic exposure and oxidative stress within the population of goldfish, more original studies are required to improve the strength of evidence. The observed dose response relationship between plastic exposure and SOD functions suggests that any level of exposure to nano- and micro-plastics via water contamination may result in changes in cellular respiration and increased risk of associated health outcomes.
Validation of qPCR Assays for the Quantification of Bacteria Associated with HIV Seroconversion, Inflammation, and Immune Cells (BASICs)

**Background:** It is indicated that specific anaerobic species in the penile microbiome are associated with higher rates of HIV-1 seroconversion, including Bacteria Associated with HIV Seroconversion, Inflammation, and immune Cells (BASIC species). Three of these BASICs, *Prevotella bivia*, *Peptostreptococcus anaerobius*, and *Dialister micraerophilus*, are of particular interest due to their high level of co-occurrence within samples and association with HIV-target cell density in the foreskin. To better characterize this triad of BASICs within clinical samples and in vitro models, we have developed species-specific quantitative PCR (q-PCR) assays. The validation of these qPCR assays is essential to detect BASICs triad species accurately and confidently, even at low concentrations.

**Methods:** Primers specific for the taxa of interest were developed using Primer3. Sensitivity and specificity were determined following MIQE guidelines for assay development. Further quantitative validation of the assays has been conducted including: using serial dilutions of a known standards, analyzing the Linear Dynamic Range, calculating average reaction efficiency, R² value, intra-assay coefficient of variation (CoV), Limit of Detection (LOD), and Limit of Quantification (LOQ).

**Results:** Assay sensitivity of 45 clinical samples containing the target species was 100%, 97.7% and 100% for *P. bivia*, *P. anaerobius*, and *D. micraerophilus*, respectively. Specificity was 100% for all species when compared against panels of up to 30 closely related taxa and co-occurring species. CoV values are <20% until concentration of 10² is reached. Reaction efficiency ranged from 92.6%-112%, with R² values all >0.98. LOD and LOQ are in progress, we are expecting both values to be below 100 copies.

**Conclusions:** Through this study, we are developing highly sensitive and specific assays for the quantification of the BASICs triad across several orders of magnitude. With these quantification techniques, we can improve our understanding of BASICs epidemiology, interaction with host inflammation through epithelial co-culture models, and dynamics within the penile microbiome. There is potential to develop HIV-1 microbiome-based prevention techniques that focus on reducing BASIC colonization in the penile microbiome, potentially providing an alternative to surgical interventions.
Evaluating the Relation between Higher Exposure to Endocrine Disrupting Chemicals and Increased Risk of Ovarian Cancer: A Systematic Review

Background: Increasing evidence suggests that exposure to endocrine disrupting chemicals (EDCs), a group of chemicals classified based on their ability to interfere with hormone function, may be associated with poor reproductive health outcomes, including several forms of cancer. These chemicals are commonly used in agricultural, personal care, and everyday consumer products, leaving many at risk for exposure. The objective of this review was to evaluate the association between elevated EDC exposure and risk of ovarian cancer amongst adults in high-income countries.

Methods: Following the protocol of the Navigation Guide, databases were searched for peer-reviewed studies fitting the defined inclusion criteria. Identified evidence was screened by title, abstract, and followed by full-text review. Included studies were assessed for risk of bias and evaluated for the overall quality and strength of evidence.

Results: Six studies were included in the final review and determined to have “probably low” risk of bias. The overall quality of evidence was determined to be “moderate” due to the risk of bias across studies and the small pool of available evidence. The overall strength of the evidence was deemed to be “inadequate” in sufficiently establishing a toxic relationship between the exposure and outcome.

Conclusion: The studies included in this review investigated a wide array of chemicals within the broad group of endocrine disrupting chemicals, which led to difficulties in establishing consistency across studies for any given chemical or chemical class (e.g., phthalates). However, most studies observed significant associations between the evaluated EDCs and ovarian cancer risk. This may suggest a relationship between EDCs, broadly, and ovarian cancer risk. Though, further studies are needed to better establish consistency with prior studies.
Examining the Effects of Green Manure Application on Maize Crop Yield in Arid Conditions: A Systematic Review

**Background:** The objective of this systematic review was to assess existing evidence on the use of green manure cover crops on maize yield in arid conditions.

**Methods:** The Navigation Guide systematic review methodology was applied for this review. Four databases were searched which resulted in 539 unique hits. The Title/Abstracts of all unique studies were screened, and relevant studies underwent a full-text review. For the final included studies, analyses of risk of bias were conducted, as well as overall quality and strength assessments of the included studies.

**Results:** Of 539 unique studies screened, only 5 matched all inclusion criteria and were included in the final study selection. All were conducted in different countries. Though all studies showed an increase in maize yield for green manure use compared to without, most studies included other fertilization methods which could have had a confounding effect. The inclusion of only field experiments limits the potential to measure one intervention at a time. Agriculture is a complex science, and it is difficult to measure a single intervention in field studies.

**Conclusion:** Despite the same direction of effect across studies, I conclude there is limited evidence of association between green manure use and maize yield in arid conditions. Still, the evidence is promising and reflects a need for more studies to be conducted in different regions and different climate conditions to determine the true effectiveness of green manure application and use of cover crops.
Occupational Exposure to Volatile Organic Compounds (VOCs) in Healthcare facilities among healthcare workers with varying degrees of exposure: A Systematic Review.

**Background:** There are a limited number of studies on occupational exposure to volatile organic compounds (VOC) in healthcare workers (HCWs). This systematic review analyzed different HCWs across multiple occupations, locations, and healthcare facilities. Differences in VOC exposure by occupation can be related to different factors such as chemical use, occupational duties, frequency, and duration of specific tasks. The purpose of the review was to analyze the variation in VOC exposures among HCWs and associated specific healthcare roles and/or assigned areas.

**Methods:** A search was conducted using the Scopus, Elsevier, PubMed, and ProQuest online databases. A search strategy was developed with search terms (VOC, Healthcare, Exposure, healthcare worker) to explore the literature, restricted by publication language (English) and date (2013-2023). The search was designed to capture evidence on occupational exposure to VOCs in a healthcare setting. 327 studies were retrieved, and 12 articles met the inclusion criteria. These studies covered the years 2013 – 2023, included populations located in eight countries, and ranged from 30 samples to 100,585.

**Results:** The studies demonstrated variability in VOC exposure among healthcare workers (HCWs), influenced by their specific roles and the areas they work in. Elevated levels of Total Volatile Organic Compounds (TVOC) were reported across various healthcare settings, surpassing established indoor air quality standards, with the highest exposures linked to activities involving cleaning, disinfection, and patient care. Factors such as healthcare activities, worker mobility, and the proximity to VOC sources were significant determinants of exposure levels. Seasonal changes, temporal patterns, and ventilation practices also significantly affected VOC concentrations, with certain studies noting improved air quality in well-ventilated and thermally conditioned areas.

**Conclusion:** Based on the Navigation Guide and criteria and this review's evaluation, I concluded that there is limited evidence of an association between role/assigned areas and level of occupational exposure to VOCs. Additional studies are needed to understand the long-term health implications of these exposures and the effectiveness of various mitigation strategies.
GWSPH RESEARCH SHOWCASE
ENVIRONMENTAL AND OCCUPATIONAL HEALTH

Unveiling Zoonotic Extraintestinal *E. coli* Burden in LMICs: A Study in Nigeria

**Background:** *Escherichia coli* ranks among the deadliest bacteria and is associated with nearly 1 million deaths globally in 2019, with 80% occurring in low- and middle-income countries¹. Contrary to conventional belief linking *E. coli* primarily with diarrheal illnesses, most deaths were caused by infections out of the gastrointestinal tract. Previous research underscores the prevalence of foodborne zoonotic strains of *E. coli* in extraintestinal infections in the United States². However, research in LMICs is limited, where factors such as extensive human-animal interaction and inadequate Water, Sanitation, and Hygiene (WASH) conditions may elevate the risk. As a part of the efforts to understand the burden of zoonotic extraintestinal *E. coli* infections in LMICs and to elucidate interplays between WASH and food animal production, we conducted a study in Nigeria, a West African nation.

**Methods:** We collected and sequenced *E. coli* isolates from both humans and food animals in Nigeria. As context, we also included meat isolates from other Africa countries retrieved from a global database. We applied a Bayesian latent class model³ that leverages 17 host-associated (either human or meat) mobile genetic elements to generate probabilistic predictions of the underlying host of the *E. coli* isolates, thereby identifying putative spillover strains.

**Results:** Among the 152 human *E. coli* isolates studied, 97 were linked to extraintestinal infections, including bloodstream, urinary tract, wound infections, etc. Applying the Bayesian latent class model, we identified 24 putative zoonotic isolates, accounting for 24.7% of the collection. This proportion is significantly higher than previous estimations in the United States, where 8% and 18% of isolates from Arizona and California, respectively, were predicted to be foodborne zoonotic.

**Conclusion:** Our findings indicate that approximately one in four extraintestinal *E. coli* infections in Nigeria may originate from food animals. Analysis of host elements and major sequence types of zoonotic *E. coli* highlights significant geographic variations between African and American isolates. Therefore, systematic collection and analysis of isolates from underexplored regions are imperative to comprehensively understand the transmission dynamics of pathogens from food animals to humans.

**Primary Presenter**
Yashan Wang

**Co-Presenter(s)**
Maliha Aziz

**Status**
Doctoral

**Authors**
Dan Park
Maliha Aziz
Edward Sung
Cindy M. Liu
Lance B. Price

**Research Mentor/Department Chair**
Lance B. Price
Inhibition of high-priority respiratory pathogens is a general feature of the fastidious nasal commensal *Dolosigranulum pigrum*

**Background**
*Dolosigranulum pigrum*, a fastidious commensal lactic acid bacterium, has been associated with *in vitro* antagonism against *Staphylococcus aureus* and lower rates of nasal *S. aureus* carriage. Better understanding of *D. pigrum* and its ecology within the nasal microbiome could point toward novel probiotic interventions. In this study, we generated a diverse collection of *D. pigrum* from nasal swabs from healthy donors, characterized nasal microbiome composition, and assessed the antagonistic potential of *D. pigrum* against four key respiratory pathogens.

**Methods**
We characterized the nasal microbiome by 16SrRNA sequencing and qPCR from self-collected anterior nasal swabs. We analyzed nasal microbiome composition based on prevalence, proportional abundance, and absolute abundance of each nasal taxa, then assigned each sample to a nasal community state type (CST) using criteria extracted by decision tree analysis. *D. pigrum* was cultured from all qualified samples. To determine *D. pigrum*’s antagonism against *S. aureus*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, and *Moraxella catarrhalis*, we developed and used a semi-quantitative *in vitro* plate-based test based on zones of clearance.

**Results**
We collected swabs from 117 participants (Mean age 22, SD = 6), which included six nasal CSTs, with approximately 38% of participants having detectable *D. pigrum* by sequencing. We cultured *D. pigrum* from samples with >10^5 *D. pigrum* 16S copies/μL, resulting in *D. pigrum* isolates from 39 unique participants (33%) (*D. pigrum* culture-positive: 2.3*10^7 *D. pigrum* 16S rRNA gene copies/μL, SD = 6.2*10^7; *D. pigrum* culture-negative: 2.8*10^6, SD = 6.2*10^6, p < .001). Most *D. pigrum* strains were isolated from participants with CST5 (n = 18) but also from CST1, CST2, CST4, CST6, and CST7. All *D. pigrum* strains tested (n = 39) showed detectable inhibition *in vitro* against *S. aureus*, *A. baumannii*, *P. aeruginosa*, and *M. catarrhalis*.

**Conclusions**
Our findings indicate that inhibition of high-priority nasal pathogens is a general feature of *D. pigrum* and underscore its probiotic potential. Future studies are needed to fully define *D. pigrum* phylogeny and its mechanisms for antagonism against nasal pathogens.
Environmental Priorities and Climate Resilience: The Priorities of Smallholder Malawian Farmers in the Adoption of Doubled-Up Legumes Technology

Introduction: This qualitative research study investigated the influence of environmental priorities and factors related to climate change on smallholder farmers’ decisions to adopt Doubled-Up Legumes (DUL) technology in Malawi. By examining smallholder farmers’ perspectives and experiences through the use of semi-structured interviews and focus groups, along with semi-structured interviews with extension officers, this study aimed to offer insights into the complexities surrounding agricultural technology adoption amidst environmental and climate change challenges.

Methods: Employing an analytical framework, the investigators conducted semi-structured interviews, focus group discussions, and informal conversations with smallholder farmers, extension officers, and infrastructure personnel. One informal interview occurred in Lilongwe, Malawi. A total of eight semi-structured interviews, one 12-member focus group, and two informal interviews occurred in Linthipe, Malawi. Two semi-structured interviews, one dual semi-structured interview, 1 abbreviated dual semi-structured interview, and one 14-member focus group were performed in Golomoti, Malawi. Thematic analysis was applied to identify recurring patterns and themes related to environmental priorities and climate change factors influencing smallholder farmers’ adoption decisions.

Results: Study findings revealed nuance in the adoption decisions of farmers when considering their environmental priorities. Despite acknowledging the benefits of DUL for soil health, farmers continue to supplement with chemical fertilizers due to perceived effectiveness and financial constraints. Farmers’ management decisions were largely driven by the availability of resources and funds. Changing precipitation patterns and water availability emerged as significant factors influencing adoption decisions, alongside the influences of socio-cultural factors and traditional farming practices. Gender dynamics played a pivotal role, with women often leading adoption efforts and community resilience-building initiatives. The results underscored the importance of tailored extension services, an expanded extension officer workforce, and leveraging “lady farmers” as key drivers in interventions promoting sustainable agricultural practices.

Conclusion: This qualitative study provides valuable insights into the complexities of agricultural decision-making among smallholder farmers in Malawi. Understanding farmers’ environmental priorities and perceptions of climate change enables policymakers and development practitioners to design interventions addressing farmers’ diverse needs while promoting sustainable economic development. Empowering farmers with tailored knowledge and resources is crucial for enhancing resilience and fostering inclusive agricultural growth, particularly in the face of environmental challenges like the drought experienced by smallholder farmers in both Linthipe and Golomoti this year.
Analysis of Residential Property Maintenance Inspections for Mosquito Breeding Sites in Fairfax Health District, VA

**Objective:** This study aimed to identify the most common container types with immature positive inspections and where immature positive inspections might occur on residential properties in future years.

**Methods:** Complete paper data (n = 424) from 2017 to 2022 were entered and summary statistics were performed. Frequencies, percentages, and proportions were computed for categorical variables. Breeding sites were isolated by week and year to identify trends in immature positive inspections. Fisher’s exact tests were performed due to > 20% of cells containing small observations (<5). Variables with highest frequencies were used in an ARIMA model to forecast potential residential breeding containers over the course of 2023-2028.

**Results:** 2018 accounted for 29.72% of all inspections (n = 126), followed by 2019 (n = 93), 2017 (n = 83), 2020 (n = 55), 2021 (n = 42), and 2022 (n = 25). Fisher’s exact tests resulted in significant p-values (< 0.05) for “French Drain,” “Window or Door Screen in Disrepair or Unsecured,” and “Public Utility Box Casing or Lid.” Most frequent breeding containers were: “Corrugated Downspout Extensions” (6/6 years), “Plant/Pot/Saucer/Gardening Container” (5/6 years), “Indication of Poor Drainage” (5/6 years), “Tarp/Cover” (5/6 years), and “Household Container” (4/6 years). Forecasts via ARIMA model (80-95% CIs) showed stability for 2023-2028, except for household container.

**Conclusions:** Larger numbers of inspections in 2018 might be due to higher-than-average rainfalls in July/August 2018. Due to the Fisher’s tests results, and sample data volume, a relationship might exist between “French Drain,” “Window or Door Screen in Disrepair or Unsecured,” and “Public Utility Box Casing or Lid” and other variables in the data. If these conditions are observed, there is likely another vessel on the property containing mosquito larvae. Top variables per year had mild fluctuations between 2020 and 2022. It is interesting to note the advancement of “Wheelbarrow or Yard Utility Cart” into the top observations. This advancement, combined with the increase of “Tarp, Cover” and “Plant, Pot or Saucer, Gardening Container,” implies a potential increase due to COVID related activities (such as gardening). “Household Container” showed the most variability, most likely because this container is dependent on human behavior and movement. The smaller sample sizes in 2021 and 2022 showed larvae breeding in a greater variety of containers. More inspection data are needed to determine whether mosquitoes are utilizing a more diverse array of breeding containers and how these selections are influenced by social and environmental conditions.
GWSPH RESEARCH SHOWCASE
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Insecticidal Potential of Boric Acid: Systematic Reviews on the Targeted Control of *Aedes aegypti* and *Aedes albopictus* Mosquitoes

**Objectives:** This pair of systematic reviews aimed to assess efficacy of boric acid attractive toxic sugar baits (ATSBs) on the control of *Aedes* aegypti and *Aedes* albopictus mosquitoes, both of whom are responsible for transmitting diseases such as dengue, Zika, and chikungunya.

**Methods:** PRISMA guidelines were used in both reviews, along with SYRCLE’s risk of bias tool, GRADE guidelines, and The Navigation Guide. The objective of the first review was to answer the question: “Among Ae. aegypti mosquitoes, what is the effect of boric acid ingestion via ATSBs, versus standard sugar meals, on mortality?” The second review addressed the same question, focusing on Ae. albopictus as the species. Inclusion criteria and keywords were devised for study identification across the following databases: PubMed, Scopes, Google Scholar, Proquest, MEDLINE, Web of Science, Virtual Health Library, and Agricola. For the Ae. aegypti review, 2,293 articles underwent title and abstract screening, leading to full-text review for 28 articles, with subsequent quality and strength evaluation for 8. In the Ae. albopictus review, 2,328 articles underwent title and abstract screening, followed by full-text review of 25 articles, and 8 were assessed for quality and strength.

**Results:** Across all studies, evidence shows boric acid consumption impacts mortality. There is a positive association between boric acid ingestion and mortality within 24-48 hours in Ae. aegypti and Ae. albopictus mosquitoes.

**Conclusions:** There is sufficient evidence of boric acid toxicity for both Ae. aegypti and Ae. albopictus in laboratory studies, and limited evidence in semi-field studies.
Climate change-exacerbated natural disasters and adverse birth outcomes: A systematic review

Background & Significance of the Study: Climate change is predicted to increase and intensify severe weather events and natural disasters. Pregnant people and their fetuses are a vulnerable population when considering health effects of climate change and natural disasters, and some pregnant sub-populations are even more vulnerable facing overlapping vulnerabilities, such as structural racism, implicit bias, and low resources.

Research Purpose: The purpose of conducting this systematic review is to examine the effects of exposure to climate change-exacerbated natural disasters during pregnancy on adverse birth outcomes (preterm birth, low birth weight, stillbirth) using the Navigation Guide.

(Preliminary) Findings & Conclusions: 17 studies met the inclusion criteria and were included in the systematic review. For each adverse birth outcome, more than half of studies examining each birth outcome concluded there was an association between the exposure and the outcome, however the risk of bias was probably high in critical domains, and the quality of the body of evidence was low. Based on the Navigation Guide, this systematic review provided inadequate evidence to state an association between climate change-exacerbated natural disasters and adverse birth outcomes.

Research Significance: While this systematic review did not conclude sufficient evidence of an association between climate change-exacerbated natural disasters and adverse birth outcomes, this topic remains extremely important for the wellbeing and existence of the population facing a changing and warming planet.
Impact of Screen Time on Child Obesity in Developing Countries: A Systematic Review

Background & Significance of the Study: The global rise in childhood obesity is a major public health concern, with developing countries experiencing a significant increase in cases. Concurrently, these regions are witnessing a surge in digital infrastructure, leading to increased screen time among children. Understanding the relationship between screen time and obesity is crucial for developing interventions to curb this growing epidemic.

Purpose of the Research: This systematic review aims to explore the association between increased screen time and obesity rates among children in developing countries. The research question focuses on whether a higher amount of screen time is correlated with greater obesity rates in this demographic, seeking to evaluate the strength and quality of the existing evidence.

Methods: A comprehensive literature search was conducted using the PubMed and Scopus databases, adhering to the Navigation Guide for systematic reviews. Inclusion and exclusion criteria were applied to identify relevant studies, starting from an initial pool of 324 papers. After rigorous screening and the removal of duplicates, five studies were selected for detailed analysis. The risk of bias and quality of evidence were evaluated for each study.

Preliminary Findings & Conclusions: The review found a general trend suggesting a correlation between increased screen time and higher obesity rates among children. However, due to the presence of confounding factors and the limitations inherent in the studies reviewed, a direct causal relationship could not be conclusively established. The evidence, while pointing towards a potential association, calls for cautious interpretation.

Implications of the Findings: The findings of this systematic review highlight the need for more in-depth, longitudinal research to fully understand the impact of screen time on child obesity. Given the significance of obesity as a precursor to numerous health issues, understanding its relationship with screen time is imperative for developing targeted public health interventions. This review underscores the complexity of addressing childhood obesity in the digital age and the importance of incorporating technological considerations into public health strategies.
Epidemiology
Anxiety after lifting the COVID-19 indoor mask mandate in Washington, D.C.

**Background & Significance:** The new and evolving responses to COVID-19 brought about significant mental health challenges for adults as they both navigated the pandemic and coped with new stressors affecting their environment and health. Against the backdrop of fluctuating masking policies following SARS-CoV2 in Washington, D.C., there is an impetus to better understand the mental health implications of preventative measures aimed at mitigating viral transmission.

**Purpose:** While existing and ongoing literature has documented decreases in anxiety associated with the adoption and enforcement of masking mandates, the extent of the mental health impacts following relaxation of these policies remain unclear. This study sought to investigate anxiety among adults before and after the indoor mask mandate was lifted in Washington, D.C. We aimed to provide greater insight into the potential impact of policy changes on population mental health.

**Methods:** Data from the US Census Bureau’s Household Pulse Survey collected from January 26-February 7, 2022, and March 2-14, 2022, was used to investigate anxiety levels before and after the indoor mask mandate was lifted in Washington, D.C. on March 1, 2022. Anxiety was measured using the Generalized Anxiety Disorder 2-item scale. Survey weighted logistic regression models were used to evaluate the association between pre- and post-mask mandate lift time periods and anxiety stratified by pre-specified risk factors for severe COVID-19.

**Findings and Conclusions:** Anxiety levels increased from 23.7% (±2.5%) in the pre-mask mandate lift period to 29.0% (±2.8%) in the post-mask mandate lift period. The odds of screening for anxiety after lifting the mask mandate was higher compared to before the policy change; however, this was not statistically significant (OR= 1.31, 95% CI: 0.89-1.94, aOR=1.00, 95% CI: 0.71-1.42). Among males, the odds of screening positive for anxiety were significantly higher after lifting the mask mandate compared to before the policy change (OR=2.45, 95% CI:1.38-4.32; aOR=1.75, 95% CI: 1.05-2.95). The converse was found among females; however, the relationship was not statistically significant. We concluded that changes in mask mandate policies may be associated with increased population anxiety levels. Population mental health must be carefully considered when changing COVID-19 related policy.

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**Primary Presenter**
Madhu Balachandran

**Co-Presenter(s)**
Sydney Bornstein

**Status**
Doctoral

**Authors**
Sydney Bornstein
Madhu Balachandran
Mark Bova

**Research Mentor/Department Chair**
Manya Magnus
Compounds containing a nitroaromatic group are used to treat a variety of conditions (e.g. Parkinson's, angina, insomnia) including parasitic infections (i.e. giardiasis, trichomoniasis, and amoebiasis). Nitroaromatic drugs are cornerstone therapies against American trypanosomiasis (Chagas disease) and African trypanosomiasis (Sleeping Sickness). This includes the clinical use of benznidazole (American trypanosomiasis), nifurtimox, and, more recently, fexinidazole (African trypanosomiasis). While the precise mechanisms of action for these chemically related drugs is unknown, it is hypothesized that nitro-drugs generate ROS stress that can damage DNA resulting in trypanocidal effects.

To test this hypothesis, we sought to evaluate the cytotoxic phenotypes associated with treatment of *Trypanosoma brucei* (African) with either benznidazole, nifurtimox, or fexinidazole. We found that both benznidazole and nifurtimox resulted in a progressive loss of cells in the G2 phase of cell cycle. In contrast, treatment with fexinidazole resulted in an increase in G2 and a loss of S phase. Using immunofluorescence microscopy we are able to track the progression of cell cycle by way of the timing of division of the mitochondrial DNA, known as the kinetoplast in these parasites, and nuclei, which can be visualized using DAPI staining. Consistent with our cell cycle results by flow cytometry, fexinidazole treatment resulted in a decrease the number of parasites with 2 kinetoplasts and 1 nucelli, further indicated a defect in DNA synthesis. In support of this observation, we then employed a BrdU incorporation assay to demonstrate that treatment with fexinidazole resulted in a pronounced loss of cells undergoing DNA synthesis, which was not observed in the related nitroaromatic drugs. To better understand the source of this DNA synthesis defect, we developed a novel assay for *T. brucei* using anti-γH2A (a mark of DNA damage) in conjunction with cell cycle to determine if treatment with each of the nitroaromatic drugs resulted in distinct cell cycle timing for drug induced DNA damage. We saw an increase in DNA-damaged cells during early treatment with fexinidazole compared to nifurtimox and benznidazole. This is significant because fexinidazole is emerging as a critical oral monotherapy against Human African trypanosomiasis and is being considered for the treatment of other related infections. The data presented here represent critical first steps toward delineating the cytotoxic effects of nitro-drugs to determine their trypanocidal mechanisms and stave off the dangerous potential of widespread nitroaromatic drug cross-resistance.
Evaluating Linked ICD-10 Medicare Claims Data as a Method of Dementia Case Ascertainment in Research Settings

Background: The United States transitioned to use of ICD-10 in 2015. Limited previous research validating use of Medicare claims data as a case-finding strategy for identifying persons living with dementia has considered ICD-10 code definitions. Here, we identified six ICD-10 code definitions for dementia from recent high-impact work and aimed to compare their sensitivity, specificity, and accuracy relative to research-based dementia ascertainment.

Methods: Eligible participants from 5 Rush Alzheimer’s Disease Center (RADC) cohort studies were aged 65 years or older, enrolled in Medicare fee-for-service, and consented to Medicare claims data linkage. We compared dementia status at each annual RADC cohort study visit between 2015 and 2019 to dementia status based on presence of ICD-10 codes denoting dementia within a 12-month period centered on the RADC cohort study visit for six ICD-10 code definitions for dementia identified from the literature.

Results: All six code definitions had high accuracy (>85%). Five of the six code definitions had high specificity (>90%) but low sensitivity (<60%), while one code definition had greater sensitivity (80%) at the expense of slightly lower specificity (87%). For all code definitions, Black participants were more likely to meet research-based but not claims-based criteria for dementia (i.e., be underdiagnosed in clinical settings) than their White peers. Age was negatively associated with accuracy.

Conclusions: ICD-10 Medicare claims data can be used to ascertain dementia cases, but selection of code definition impacts sensitivity, specificity, and accuracy of results, and performance varied by participant characteristics. Understanding the measurement properties of the code definition used may help inform bias mitigation strategies in studies using Medicare claims data to ascertain dementia.
HIV risk behavior among older people who inject drugs in Washington, DC prescreening for HPTN 094

Background: Older people who inject drugs (PWID) remain at risk for HIV. We investigated the prevalence and correlates of HIV risk behaviors among older PWID recruited for participation in HPTN 094 through community-based outreach in Washington, DC.

Methods: We conducted a cross-sectional analysis of self-reported survey data collected between June 2022 and June 2023 from adults recruited through outreach at known drug hotspots in Washington, DC. To be eligible for the analysis, respondents had to report injection drug use in the past 3 months and be aged >50. We used simple and multivariable logistic regression to determine correlates of condomless sex, sharing syringes/needles, and sharing other injection equipment in the last 3 months. Variables with a p<0.05 in unadjusted analyses were included in the multivariable models.

Results: Among 260 PWID aged >50, 90% were Black/African American, 82% were male, 51% were aged >60, and 7% reported living with HIV. In the last 3 months, 47% sought treatment for addiction, 44% experienced homelessness, 19% reported an unmet healthcare need, 18% were hospitalized, 14% reported an overdose, and 6% were incarcerated. The most commonly reported injection drug used in the last 3 months was heroin (97%), followed by fentanyl (43%), cocaine (31%), other opioids (5%), depressants (3%), and methamphetamine (2%). Over half of respondents (57%) injected more than one substance. In the last 3 months, 42% reported at least one HIV risk behavior, 28% engaged in condomless sex, 22% shared other injection equipment, 7% shared syringes/needles, and 11% reported more than one HIV risk behavior. Depressant injection was significantly associated with condomless sex (OR 5.61, 95%CI 1.36-23.06). In multivariable analyses, reporting an overdose in the last 3 months (aOR 3.18, 95%CI 1.08-9.36) and other opioid injection (aOR 4.61, 95% CI 1.04-20.40) were independently associated with sharing syringes/needles. Experiencing homelessness (aOR 2.20, 95% CI 1.17-4.13), reporting an overdose (aOR 2.57, 95% CI 1.18-5.61), and depressant injection (aOR 6.72, 95%CI 1.49-30.24) were also independently associated with sharing other injection equipment.

Conclusions: Our findings suggest that older PWID in DC are engaging in HIV risk behaviors, specifically those who report experiencing homelessness, recent overdose, and injecting certain substances. Older PWID in urban areas like DC are still at risk for HIV. Tailored HIV prevention strategies are needed for this unique population.
HEALTHCARE UTILIZATION OVER TIME IN THE DC COHORT — EXPLORING THE ROLE OF AGE, VACS SCORE AND THE COVID-19 PANDEMIC

Background

The COVID-19 pandemic disrupted health-seeking behavior, and individuals with HIV who are aging and/or have more advanced clinical disease may have had significant changes in their healthcare utilization due to COVID-19. The objective of this study was to evaluate the impact of age, Veterans Aging Cohort Study (VACS) Index score (a mortality prediction score that is a proxy of comorbidity burden), and COVID-19 on HIV encounter completion.

Methods

We applied a repeated cross-sectional study design using a longitudinal cohort of Washington, DC-based PWH participants receiving HIV care. VACS index combines commonly collected clinical biomarkers (age, CD4 count, HIV viral load, hemoglobin, AST, ALT, platelet count, creatine levels, and Hepatitis C infection) to estimate HIV disease severity. Descriptive statistics, including the VACS index, by age group were calculated to characterize the participants and the number of HIV clinical visits in 2018, 2020, and 2022. We used zero-inflated negative binomial modeling to examine the relationship between estimated encounters, year, age, and pre-COVID VACS Index. HIV RNA suppression was assessed among those with and without HIV encounters during assessment years. A sensitivity analysis was repeated among a subset of DC Cohort participants receiving care at hospital-based sites.

Results

There were 4,041 participants (72% men, 59% ages 50-59, 79% black) in the DC Cohort eligible for analysis. In 2018, the mean VACS Index for 50-59, 60-69, and 70+ years were 28 (SD 16), 37 (SD 18), and 41 (SD 16), respectively. All age groups declined in encounters from 2018 to 2020 without recovery in 2022. Higher pre-COVID VACS is associated with increased encounters. The 70+ age group remained the lowest number of encounters through assessment. Additionally, the number of encounters decreased significantly in 2020 and 2022 from pre-COVID levels (p<0.0001). Participants were less likely to have an HIV encounter in 2022 (RR 0.68; 95% CI 0.65 to 0.71) than in 2018, adjusted for age group and site. Among participants with encounters, over 82% were virally suppressed during all assessment years.

Conclusion

These findings highlight the impact of the pandemic on accessing healthcare among the most vulnerable people living with HIV (PWH). To mitigate gaps in HIV care utilization post-pandemic, there is a need to develop tailored care models for PWH, which take into account their local context, clinical status, and preferences. This approach could help to address broader public health issues related to HIV care.
Estrogen and Progesterone Receptor Gene Expression in Peripheral Blood Mononuclear Cells from Transgender Individuals on Feminizing Hormone Therapy: Implications for HIV Risk

**Background:** Transgender women (TW) have been shown to have a greater risk of acquiring HIV as compared to cisgender men who have sex with men, even after controlling for risk factors such as age, depression, stigma, violence, and condomless receptive anal intercourse. The biological mechanisms that contribute to the increased risk require further assessment, including the role of long-term treatment with synthetic estradiol (E2) as part of feminizing hormonal therapy (FHT). E2 and progesterone (P4) regulate innate and adaptive immune responses through engagement with estrogen receptor (alpha and beta (ER-α, β)) and progesterone receptor (PGR), respectively. E2 is considered protective against HIV infection while P4 has enhanced HIV infectivity in certain models. However, the effects of FHT on estrogen and progesterone receptor expression in those who are assigned male at birth (AMAB), have not been determined.

**Methods:** We recruited 37 participants AMAB, including 17 who identified as TW and had been on E2 therapy for at least six months (Long-term FHT group). The No FHT group consisted of 7 participants AMAB not on FHT who identified as cisgender men (CGM). Additionally, we included a longitudinal component that enrolled 7 participants AMAB of varying gender identities before starting FHT (Pre-Short-Term FHT), 6 of whom were sampled again three months after starting FHT (Short-term FHT). Participants from all groups were HIV-negative, sexually active, not on pre-exposure prophylaxis (PrEP), and were recruited from the Washington, D.C. metro area. Blood samples were collected, and peripheral blood mononuclear cells (PBMCs) were isolated from all samples used in the study. RNA was then isolated from the PBMC samples, quantified, and cDNA was synthesized followed by TaqMan RT-PCR to determine gene expression of ERα, ERβ, and PGR. Relative gene expression was calculated using CGM as the reference group and β-actin (ACTB) as the reference gene.

**Results:** Relative expression of ERα and ERβ were not significantly different among FHT vs non-FHT groups, as well as longitudinal comparison of Pre-Short-Term FHT vs Short-term FHT. PGR expression was not observed in any of the samples.

**Conclusion:** Our data indicates similar gene expression patterns of ERα and ERβ in participants AMAB on FHT vs non FHT. However, further research is needed to understand the impact of FHT on immune pathways that may be dysregulated in TW, potentially impacting HIV risk.
Characterizing the first 6-year hospital data for sarcopenia using its first International Classification of Diseases (ICD) diagnosis code

Sarcopenia is an aging-related disease characterized by muscle mass loss and wasting and is among the most significant causes of frailty among the elderly. Despite it being a detrimental condition, it only recently, as of October 1, 2016, received the International Classification of Diseases (ICD)-10-CM code, M62.84, thus being recognized as a disease. Thus, there is a novel opportunity to analyze recent medical records to further characterize and understand sarcopenia. Literature suggests that highly walkable areas are associated with positive health and fitness outcomes. Previous research on the relationship between neighborhood walkability and sarcopenia specifically has shown mixed results, highlighting a possible non-linear association between walk score and disease outcome.

The purpose of this analysis was to further characterize the descriptive epidemiology of sarcopenia using patients in a Massachusetts-based healthcare system, as well as to evaluate the potential protective effect of high walkability on sarcopenia.

The Mass General Brigham (MGB) Research Patient Data Registry (RPDR) was used to identify sarcopenia patients who 1) had a Massachusetts address and 2) were not hospital employees. 343 Sarcopenia patients were matched on sex and race to 342 controls. Walk scores and median household income were generated for each zip code provided by patients in the RPDR. A univariate regression model was generated for walk score categories as defined by Walkscore.com. A multivariate regression model was created to evaluate the relationship between independent walk score, marital status, race, ethnicity, income, and sex and dependent variable sarcopenia.

In the multivariate logistic regression model, adjusted for gender, race, ethnicity, marital status and median household income by zip code, the Very Walkable (OR: 1.648, 95% CI: 1.0693 - 2.5507, p=0.004) and Walker’s Paradise (OR: 2.6241, CI: 1.4038- 5.0779, p<0.001) range of Walk Scores were still significantly associated with higher odds of sarcopenia.

The results suggest that increased residential walkability is not sufficient to prevent nor reverse the clinical loss of muscle tone. Thus, grand muscle loss as seen in sarcopenia cannot simply be prevented through incidental exercise, but rather through a more concerted effort to increase physical exercise through weight-bearing activities, for example. Additional longitudinal research is needed to further evaluate the relationship between lifetime residential walkability and sarcopenia.
Characteristics and Treatment Regimens of HIV-Associated Lipodystrophy Disease among a Cohort of Persons with HIV in Washington, DC

Background and Significance: HIV-associated lipodystrophy (HAL) is a side effect of early (1990’s) antiretroviral therapy (ART), specifically Nucleoside Reverse Transcriptase Inhibitors (NRTIs). Incidence of HAL has decreased among people with HIV (PWH) due to advancements in ART. HAL is characterized by either the accumulation or depletion of the body’s adipose tissue, lipoatrophy and lipohypertrophy, respectively. Though the etiology of HAL is unknown, it is linked to hyperglycemia, insulin resistance, hypertension, high cholesterol, and depression.

Purpose/Hypothesis: We sought to describe the characteristics of PWH with HAL, HAL treatment, and ART use in a cohort of PWH in Washington, DC.

Methods: Data for this analysis are from the DC Cohort, an ongoing prospective longitudinal study of PWH receiving care at 14 care sites in Washington, DC, which has been enrolling participants since 2011. PWH participants with ICD 9/10 code (272, E88.1) indicating lipodystrophy were identified; treatments were based on an Egrifta™ or Tesamorelin™ prescription. Bivariable analysis of demographic, socioeconomic, medical, and HIV characteristics among PWH with HAL were compared by HAL treatment status. We also documented the use of specific ART regimens over time among those with HAL.

Findings and Conclusions: Between 2011 and 2023 we identified 319 PWH with evidence of HAL in the cohort, with documented treatment among 7%. HAL diagnosis for most people occurred between 2015 and 2019, with the earliest treatment in 2011. The majority of PWH with HAL were male (75%), non-Hispanic Black (61%), 50-59 years old (37%), employed (34%), had permanent housing (96%), and public insurance (61%). Substance use was prevalent among 37% of PWH with HAL. Among the HIV measures, 65% had a most recent HIV RNA <200 copies/mL; 95% had a most recent CD4 count ≥200 cells/µL and 65% had a history of an opportunistic infection. Comparing PWH with HAL with and without treatment, the majority of those receiving treatment had a mental health disorder (83% with treatment vs. 61% without, p=0.04). INSTI-based ART was the most prevalent among PWH with HAL in our study (35%), with dual-class ARVs being the second most prevalent regimen (24%).

Implications: Though rare, HAL remains prevalent among PWH in our cohort, despite the increased use of modern ART regimens. Thus, clinicians should be aware of comorbid medical concerns among those with HAL.
Vaginal Immune Dysregulation in Transgender/Non-binary Individuals on Masculinizing Hormone Therapy

**Background and Objectives:** Many transgender men and non-binary (TMNB) people receiving gender-affirming care take synthetic testosterone as part of their masculinizing hormone therapy (MHT) regimen. This population is disproportionately affected by HIV and other sexually transmitted infections (STIs). Testosterone is known to have immunosuppressive activity and may modulate HIV/STI susceptibility. Yet little is known about the immunological characteristics of the vaginal mucosa in people assigned female at birth (AFAB) on MHT. Our objective was to characterize the vaginal immune microenvironment of AFAB TMNB individuals on MHT.

**Methods:** We conducted a cross-sectional study of 72 AFAB participants from the Washington, DC metro area (aged 18-44, sexually active, HIV-negative), comparing 36 TMNB participants who had been on MHT for at least six months with a control group of 36 cisgender/non-binary participants not on MHT. Participants completed a demographic and behavioral survey, had blood drawn, and self-collected vaginal swabs. Enzyme-linked immunosorbent assays (ELISAs) were used to assess the concentrations of inflammatory and antimicrobial immune biomarkers (R&D Systems) in vaginal swab supernatants, and hormone concentrations (DRG International) in blood plasma. Mann-Whitney U tests were used to compare vaginal biomarker concentrations between study groups, and simple linear regression to assess the correlations between vaginal biomarker concentrations and testosterone levels in plasma (GraphPad Prism 10.0.2). Demographic and behavioral characteristics were compared between groups using Mann-Whitney U, Chi-squared, and Fisher’s exact tests, as appropriate (R Studio 2023.09.0)

**Results:** Six of the eight inflammatory biomarkers tested were significantly higher in the MHT group compared to the No MHT group. All three antimicrobial biomarkers tested were significantly lower in the MHT group. Plasma testosterone concentrations positively correlated with inflammatory and negatively correlated with antimicrobial vaginal biomarker concentrations. Age, race, income, hormonal contraceptive use, and sexual behavior—including vaginal sex—were similar between the groups.

**Conclusions:** We found evidence of vaginal immune dysregulation in TMNB individuals receiving MHT. This is a potential underlying mechanism that may affect HIV/STI susceptibility. The high proportion of TMNB participants who reported engaging in vaginal sex underscores the relevance of vaginal immune status in this population. Our findings add to the scant body of knowledge available on the immunomodulatory effects of testosterone in the vagina and may inform future studies on sexual health in TMNB. Our findings do not negate MHT as a clinically safe standard of care for TMNB, but point to an indication for integrating HIV/STI prevention services into gender-affirming care programs.
Vitamin D and Cancer Associations among Racial and Ethnic Minoritized Groups: A scoping review

**Background:** Examining the intersection of vitamin D and cancer among racial and ethnic minoritized groups is pivotal due to enduring health disparities. These groups suffer disproportionately higher cancer incidence and mortality rates, as well as deficiencies of serum vitamin D (25-hydroxyvitamin D; 25(OH)D) levels. Understanding how levels of vitamin D impact cancer risk, particularly among diverse racial/ethnic groups, may shed light on potential avenues for targeted interventions and research.

**Purpose:** This scoping review offers critical insights into the complex interplay between race/ethnicity, vitamin D status, and cancer incidence, fostering advancements toward equitable healthcare and tailored interventions for minority populations.

**Methods:** This scoping review follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for scoping reviews (PRISMA-ScR) and the Arksey and O’Malley’s framework.

**Preliminary Findings:** The initial search strategy yielded 481 unique studies where 339 were considered irrelevant in the title-abstract screening and another 98 studies were excluded in the full-text screening. The remaining 44 studies, focusing on associations between serum 25(OH)D levels and cancer outcomes with racial and ethnic stratification, were included for analysis. The studies had varying designs, populations of focus, and cancer outcomes of interest. The top 3 cancers of interest were prostate (n=14), colorectal (n=10), and breast (n=10) cancers. Serum 25(OH)D levels were measured similarly across all studies. Many studies found and reported an increased vitamin D deficiency in minoritized racial/ethnic groups. Out of 44 studies, 32 studies found a significant association between low 25(OH)D status and their cancer outcome of interest, with many finding significant associations among minoritized racial/ethnic groups. Analysis is ongoing and full results will be available on poster day.

**Implications:** Because a majority of the studies demonstrated a significant association, it will be important to identify specific types of cancer and demographic groups that may benefit most from targeted research and interventions. Results of this scoping review will determine gaps in the literature and directly inform a larger quantitative study looking at the possible relationships between vitamin D status, race and ethnicity, and cancer outcomes.
**Antibody responses to COVID-19 vaccination in individuals with Specific Antibody Deficiency**

**Background:** Specific antibody deficiency (SAD) is an immunodeficiency disease characterized by recurrent respiratory infections and impaired IgG responses to polysaccharides antigens despite normal immunoglobulin levels. Patients with SAD have been shown to have a higher risk of severe COVID-19 compared to the general population. However, individuals with primary antibody deficiencies have been excluded from the original COVID-19 vaccine clinical trials, and the B cell compartments before and after vaccination have not been analyzed in detail in SAD patients. This study aims to investigate whether the B cell compartment is impaired in individuals with SAD and to determine if cellular differences correlate with changes in total and antigen-specific antibody isotypes and subclasses following COVID-19 vaccination.

**Methods:** This is a case-control study using samples from a previous prospective study that included 8 SAD patients and 10 healthy controls. The blood samples were collected pre- and post-COVID-19 vaccination. Levels of circulating antibodies (IgG, IgA, and IgM) and SARS-CoV2 S-protein-specific antibodies (IgG, IgA, and IgM) were measured in plasma 2-8 weeks post-vaccination using MSD immunoassay. Statistical analyses compared total and antigen-specific immunoglobulin levels in the SAD vs Control group using the Mann-Whitney U test (Prism 10.2.1).

**Results:** We observed a trend of SAD individuals having lower levels of circulating IgG, IgA, and IgM antibodies in plasma compared to healthy controls. The SAD group also had lower levels of S-protein-specific IgG and higher levels of S-protein-specific IgM antibodies.

**Conclusions:** Our data show discrepancies in total and vaccine-specific antibody titers in individuals with SAD compared to controls. Although no significant differences were observed in antibody levels but rather trends, this is likely due to a small sample size. As this immunodeficiency is not well understood, our study provides novel insight into host responses to pathogens in immunocompromised people and a better understanding of SAD, which can help with clinical diagnosis and treatment in the future.
Evaluation of an Online Mentorship Program to Support Aspiring and Current Scholars in Public Health

**Background:** With the rise in enrollment in public health schools and programs at the graduate level, the Public Health Student Network (PHSN) was created to support current and aspiring graduate students of all backgrounds through peer mentorship and tailored workshops. This work evaluates the effectiveness of the program’s first implementation cycle for the 2022-2023 academic year.

**Method:** PHSN adapted existing mentorship models applied in other disciplines to fit the needs of public health students. The program consists of two parts: online peer-led group workshops and ongoing dissemination of information and resources through social media (Instagram and LinkedIn). Between 2022 and 2023, five workshops were held online from September to January and covered topics on graduate program preparation and the application process. Current Master’s or PhD level graduates led the workshops and answered questions from the audience. Participants completed a pre- and post-workshop evaluation questionnaire regarding knowledge and needs related to graduate school application, preparation, and professional networking. The post-program survey assessed overall program satisfaction and self-efficacy and sought recommendations for future webinars.

**Results:** 89 individuals completed the pre-workshops survey; the majority of them were working full-time (40%) or were current public health graduate students (20%) and located in the United States (71%). 49% were interested in applying to MPH/MS programs, and 43% to PhD programs located in the United States (71%). Prospective students showed the most interest in the following concentrations: Epidemiology (61%), Social and behavioral sciences (37%), Health Education/Health Promotion (33%), and Health Policy and Management (30%). After attending webinars, 27 attendees filled out the post-webinar survey. Most attendees found that the information presented was helpful (96%) and felt more prepared to complete the applications (82%). Attendees appreciated the welcoming and supportive environment and being able to engage with webinar speakers and ask questions. Some of the suggestions for future webinars were to include networking/breakout sessions to connect with students based on public health interest areas and cover topics such as funding, writing a statement of purpose, and preparing for careers in public health in more detail.

**Conclusions:** Online peer-led mentoring and support offered by PHSN complement the traditional sources of graduate school application guidance and increase access to education in public health. PHSN also addresses the need to cultivate transparent academic spaces for students in public health. This program highlights the effectiveness of using social media to establish and maintain global networks of students.
Relationship between Chronic Disease and Opioid Use Disorder in the United States, NSDUH 2015-2019

**Background:** The opioid epidemic has witnessed a steady increase in overdoses and fatalities in recent years, compounded by large spikes during the COVID-19 pandemic. To gain a better understanding of risk factors, this cross-sectional study sought to investigate the relationship between individuals with certain chronic diseases and opioid misuse over the past 12 months.

**Methods:** Data on chronic diseases and opioid use were obtained from the National Survey on Drug Use and Health (NSDUH) from 2015 to 2019. Chronic diseases investigated included asthma, cancer, chronic obstructive pulmonary disease (COPD), diabetes, hepatitis, heart conditions, high blood pressure, HIV/AIDS, kidney disease, and liver disease. Opioid misuse was defined as opioids used in any way not directed by a doctor over the past year. Annual family income was stratified between seven levels to test for effect modification within the chronic disease-opioid relationship. Univariate, chi-square, and multivariate analyses were performed using SAS v9.4 (SAS Institute, Cary, NC, USA). Multiple demographic variables identified as potential confounders from previous literature were controlled for in the analysis.

**Results:** Of the 67,182 participants that met the study criteria, 54% were female, 98.4% suffered from at least one chronic disease, and 37% of families had an income greater than $75,000 annually. Among the ten chronic diseases investigated, COPD (OR 1.27; 95% CI: 1.07, 1.50; p=0.06), Hepatitis (OR 4.70; 95% CI: 3.12, 7.07; p=<0.0001), and HIV/AIDS (OR 1.77; 95% CI: 1.07, 2.93; p=0.03) were significantly associated with increased odds of opioid use over the past year when controlling for confounders. Diabetes was associated with lower odds of opioid use (OR 0.68; 95% CI: 0.53, 0.87; p=0.0028). Heart conditions (p=0.58), kidney disease (p=0.81), liver disease (p=0.82), asthma (p=0.51), cancer (p=0.92), and high blood pressure (p=0.19) were not significantly associated with opioid misuse. Income was found to modify the relationship between opioid misuse and diabetes (p=0.02) and hepatitis (p=<0.0001) and was investigated as an effect modifier in these analyses.

**Conclusion:** This analysis demonstrates different relationships between individual chronic diseases and opioid misuse. Several, but not all chronic diseases appear to be associated with opioid misuse which corroborates data from previous research. Further research is necessary to further examine these relationships.
HIV Prevention Service Use Among PWID in Washington, DC, Pre- and Post-COVID Lockdown (2018 vs. 2022)

**Background:** The COVID-19 pandemic disrupted access to critical healthcare and HIV prevention services for people who inject drugs (PWID). We explored the differences in the use of healthcare and HIV prevention services among PWID in Washington, DC in 2018 compared to 2022.

**Methods:** We used data from the 2018 and 2022 National HIV Behavioral Surveillance system in Washington, DC. PWID were recruited via respondent-driven sampling (RDS) and were ≥18 years old, resided in the Washington metropolitan statistical area, and reported injecting non-prescribed drugs in the past 12 months. Self-reported healthcare and HIV prevention service utilization, drug-use behaviors, and drug treatment were assessed. RDS-weighted percentages were calculated; Rao-Scott chi-square tests identified significant differences in service utilization and drug use behaviors comparing 2018 and 2022.

**Results:** N=511 participants in 2018 and N=229 participants in 2022 were included in the analysis. More than 70% of both samples were male. Compared to 2018, a higher proportion of PWID were >65 years old and never been married, and fewer identified as Non-Hispanic Black in 2022. In 2022, a higher proportion of PWID reported using ≥2 most frequently injected drugs (3.9% vs. 14.1%, p<0.0001), having opioid overdose (19.8% vs. 32.4%, p=0.0303), owning naloxone (44.0% vs. 79.5%, p<0.0001) and seeking out fentanyl (6.9% vs. 27.6%, p<0.001) in the past year. Fewer PWID obtained needles from syringe service programs (SSPs) over time (76.6% vs. 62.4%, p=0.0292), but a larger proportion in 2022 obtained needles from places other than SSPs or HIV prevention programs (8.1% vs. 23.2%, p=0.0035). No differences were found in having a usual healthcare source, HIV testing, PrEP awareness and uptake.

**Conclusions:** Healthcare utilization and drug use behavior among PWID changed significantly over time. The observed decline in SSPs service use may pose challenges in providing effective and accessible HIV-related services for PWID. Increases in seeking out fentanyl and concurrent use of multiple drugs may elevate the risk of overdose. It is crucial for public health professionals to be ready to track and address rapidly evolving trends. Future directions include understanding drivers of changing trends and optimal public health responses.
Sexual Health of Transgender Men on Testosterone

Background and Purpose: The extent to which gender-affirming hormones, specifically testosterone for transgender men and non-binary people (TMNB), affect one’s immune system is not well established. However, a weakened immune system increases the risk of infectious diseases. To that end, we studied the prevalence of high-risk HPV (hrHPV) in this population and compared their rates to a control group of cisgender women (CW). hrHPV genotypes are among the most common sexually transmitted infections (STI) in the United States, with HPV16 and HPV18 being associated with ~90% of cervical and ~80% of anal cancers. Therefore, determining whether there is a correlation between using testosterone as a gender-affirming hormone and an increased risk of hrHPV could be relevant for individuals that depend on this form of care.

Methods: In all, 35 TMNB (median age: 26.5 yr) and 37 CW (median age: 28.5 yr) were recruited and provided three self-collected specimens. Immediately following collection, oral swabs (OS) were placed in phosphate buffered saline, while anal swabs (AS) and vaginal swabs (VS) were placed in separate PreservCyt vials. DNA was extracted from all 3 sample types using the QIAamp DNA Mini Kit (Qiagen). AmpFire High Risk HPV Genotyping Assay was used to detect DNA from E6/E7 target in 15 hrHPV genotypes as well as human beta globin gene target (internal control) from all 3 sample types via isothermal amplification and fluorescent detection.

Findings and Conclusions: Validity of the results for each specimen was determined by detecting the endogenous gene target. Overall, 209 (96.8%) samples had valid results (Table 1). TMNB had a 2.4-fold higher prevalence of hrHPV in VS when compared to CW, though this was not statistically significant (p=0.183).

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>TMNB</th>
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<th>CW</th>
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<tbody>
<tr>
<td></td>
<td>+ / total</td>
<td>%</td>
<td>hrHPV genotypes</td>
</tr>
<tr>
<td>OS</td>
<td>0 / 35</td>
<td>0%</td>
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Table 1: Summary of hrHPV genotypes detected between the study and control groups

Possible link between higher rates of HPV detection and the group of participants using testosterone may suggest that this population is more susceptible to STIs. This finding may serve as a starting point for future research to establish the care people using gender-affirming hormones require.

Exercise for mental wellbeing in bipolar disorder: A systematic review

Background: Exercise has a demonstrated, inverse association with depression and depressive disorders, suggesting it may be helpful in bipolar disorder (BD) to promote recovery. However, the impairing elevation that defines BD suggests guidelines may not be directly generalizable. The objectives of this systematic review were to 1) synthesize evidence of the impact of exercise interventions on mental wellbeing in persons with BD, and 2) identify key gaps in this evidence to inform development of targeted intervention trials for this population.

Methods: Studies were searched from inception to October 2023 in CENTRAL, CINAHL, PEDro, PsycINFO, PubMed, Scopus, and SPORTDiscus using commensurate search strings tailored to the format of each database. Original, peer-reviewed studies were included if participants with BD could be analyzed as an independent group, exercise was assigned (rather than passive monitoring of naturalistic activity) irrespective of type or ‘dose’, and the study was conducted with a comparator group or pre-post design, if single-arm. Outcome measures of mental wellbeing included mood and related domains (e.g., depression, mania, anxiety, quality of life), not cognition. Two independent reviewers screened titles with abstracts and full-text reports and extracted data. Risk of bias will be assessed using the RoBANS-2 tool. Narrative synthesis is provided at this time, due to the wide range of outcome measures, with potential meta-analyses pending.

Results: The initial search yielded 9,596 articles, with 1,541 duplicates, leaving 8,055 articles for review. Following screening, 75 articles underwent full-text review. Ten articles met the inclusion criteria, comprising eight studies with 420 participants (351 with BD). Results suggested tolerability of exercise interventions, and neutral to positive impacts on self-reported wellbeing in BD, ranging from decreased depression to improved quality of life, tension/tranquility, and revitalization.

Conclusion: Preliminary evidence suggests that exercise may therapeutically benefit BD recovery, particularly by reducing depressive symptoms. Most studies were too small to detect significant differences between groups—different modalities, or BD compared to a different/no condition—and pre-post intervention effects were small. Lifestyle approaches/unsupervised activity, while important for gauging effectiveness, may not be adequately controlled for measuring large-scale efficacy specific to BD features. Future studies would benefit from more rigorous and controlled study designs with larger sample sizes, to definitively conclude to what extent and how exercise impacts mania, depression, anxiety, and other comorbid symptoms in persons with BD. Real-time mental health assessments and laboratory measurements would further improve strength of evidence.
Human Papillomavirus Infection as a Risk Factor for Mpx Proctitis

**Background:** Clinical manifestations of severe mpx differ between people with and without HIV. People with HIV (PWH) have a higher likelihood of death, hospitalization due to mpx, and proctitis, severe inflammation of the anorectal region. Human papillomavirus (HPV) is found among 75-90% of PWH who identify as men who have sex with men (MSM). HPV has previously been found to alter the cervical tissue in women when found in the presence of other sexually transmitted infections (STIs). Therefore, it is possible that HPV may play role in the manifestation of mpx proctitis.

**Objective:** Examine whether HPV is a risk factor for mpx proctitis and determine whether HIV is an effect modifier for the association.

**Methods:** We are conducting a 1:1 case-control study to evaluate the association between HPV and mpx proctitis. Participants are eligible if they are at least 18 years old, had mpx in the past 2 years, and either have HIV or are at an increased likelihood of HIV acquisition. Cases are defined as anyone who had proctitis during the course of their mpx infection and controls are people who had mpx but did not have mpx proctitis. Participants will attend one study visit during which they will undergo an anal pap smear procedure and complete a survey on their mpx symptoms. Samples collected from the anal pap smear are sent to Labcorp and Dr. Jeanne Jordans lab for evaluation of HPV and residual mpx DNA. Univariate, bivariate, and multivariable regression methods will be used to determine whether HPV is associated with mpx proctitis. Stratified odds ratios and a likelihood ratio test of a regression interaction term will be used to evaluate HIV is an effect modifier. All tests will be conducted at a significance level of 0.05.

**Preliminary Findings:** This project is ongoing. We currently have 10 participants (5 cases, 5 controls) recruited to the study and our goal is to recruit 30 (15 cases and 15 controls). All participants are male with a median age of 40 years old. All participants are PWH and none were previously vaccinated against HPV. Among cases, 3 out of the 5 had a prior history of an abnormal anal pap smear and among controls, only 1 of the 5 had a prior abnormal pap smear. Confirmatory lab results are pending further participant recruitment.

**Implications:** Preliminary results suggest anal cytology may differ among people with mpx proctitis, but further recruitment and laboratory confirmation is still pending.
Application of STOPP Criteria in an Urban Cohort of People Aging with HIV

**Background:** The validated Screening Tool of Older People’s Prescriptions (STOPP), which identifies potentially inappropriate prescribing (PIP), i.e., treatment for which the potential risk outweighs the potential benefit, may be particularly important for aging people with HIV (PWH) and comorbidities. PIP may exacerbate symptoms and worsen adherence, which is particularly relevant among PWH.

**Objective:** (1) Apply STOPP to identify PIP among an urban cohort of PWH aged ≥50 years with ≥1 comorbidity; (2) Describe correlates of PIP; (3) Evaluate the relationship between PIP, symptom burden and quality of life (QOL).

**Methods:** We analyzed data from the DC Cohort, a multicenter longitudinal study of 12,000 PWH receiving care in Washington, DC. Participants completed symptom burden, social determinants of health, and QOL surveys. Symptom burden was measured with a continuous global distress index of symptoms and symptom severity. We used STOPP to identify PIP and evaluated unadjusted/adjusted logistic regression models to determine factors associated with PIP. We then used structural equation modeling to evaluate whether symptom burden mediates the relationship between PIP and QOL.

**Results:** Of the eligible DC Cohort participants, 902 completed surveys and 511 (56.6%) had STOPP-designated PIP. The most common body systems for PIP were musculoskeletal (N=349 (38.7%)), central nervous (N=335 (37.1%)), and urogenital (N=259 (28.7%)). The strongest predictor of PIP was hypertension (aOR (95% CI): 5.17 (3.15, 8.51)). Non-Hispanic White participants were significantly more likely to have PIP than Non-Hispanic Black participants (aOR: 2.45 (95% CI: 1.42, 4.23)). Older age, having a housing or utility need, or receiving HIV care at a hospital versus a community site were all significantly associated with increased odds of PIP (Table 1). In mediation models, symptom burden was a statistically significant as a mediator, but the direct effect (non-mediated) of PIP on QOL was not significant.

**Implications:** We found that over half of our participants had a PIP and that hypertension is a strong predictor of PIP. Future interventions should use STOPP as a means of alerting clinical teams to clinically relevant PIP, especially among the high-risk groups identified here.
GWSPH RESEARCH SHOWCASE

EPIDEMIOLOGY

Association of Midlife Air Pollution Exposures and Residential Road Proximity with Cognitive Decline over 28 Years: The Atherosclerosis Risk in Communities (ARIC) Study

Background: Limited research has explored the associations between midlife ambient air pollution exposures and cognitive decline, despite the potential etiologic relevance of midlife exposures. We therefore considered whether midlife exposure to air pollutants and traffic are associated with 28-year cognitive decline from mid- to late-life in the Atherosclerosis Risk in Communities (ARIC) study.

Methods: Our sample included Black and White ARIC participants from four sites, Forsyth County, North Carolina; Jackson, Mississippi; Washington County, Maryland; and the suburbs of Minneapolis, Minnesota, who were free of dementia and completed cognitive testing at Visit 2 (1990-1992). Participants were asked to complete 3 cognitive tests -- Delayed Word Recall Test (DWRT), Digit Symbol Substitution Test (DSST), and Word Fluency Test (WFT) – at Visit 2, Visit 4 (1996-1998), Visit 5 (2011-2013), Visit 6 (2016-2017), and Visit 7 (2018-2019). At participant addresses, we estimated: [1] 1990-1992 average ambient air pollutant concentrations by combining output from the Community Multiscale Air Quality (CMAQ) chemical transport model fused with observed annual concentrations and [2] distance to major roads and road density within 500m radius as measures of traffic exposure. We used adjusted linear mixed-effects models to quantify associations between exposures and 28-year cognitive change.

Results: Among 12,700 eligible participants, median age was 57 years, 56.0% were female, 24.2% identified as Black, and 78.9% had attained at least a high school education at baseline. Higher levels of nitrates, copper, and lead were marginally associated with greater 28-year decline in DSST performance; no other exposures were associated with cognitive decline in adjusted models.

Conclusions: Higher midlife exposure to select components of airborne PM2.5 including neurotoxic trace metals may be linked to decline in processing speed.

Primary Presenter
Ziwei Song

Co-Presenter(s)
NA

Status
Doctoral

Authors
Katie Lynch
Naa Adoley Parker-Allotey
Erin E. Bennett
Xiaohui Xu
Eric A. Whitsel
Richard L. Smith
James D. Stewart
Eun Sug Park
Qi Ying
Emma K. Stapp
Melinda C. Power

Research Mentor/Department Chair
Melinda Power
Exercise and Nutrition Sciences
**Background:** Lack of physical activity (PA) is associated with increased risk for chronic diseases, but there are no interventions designed to increase PA in Central American immigrant men. Using mixed-method concept mapping, this study aimed to explore PA behaviors these men considered healthy; it also probed the frequency they self-reported engaging in such behaviors.

**Methods:** Central American immigrant men aged 45-64 years old living in Washington D.C. with a body mass index (BMI) of 25 kg/m² or greater were eligible to participate. They were recruited to complete one or more of the following concept mapping activities: 1) brainstorming, 2) sorting, and 3) rating. For brainstorming, participants (n=25) generated statements in response to the focus prompt, “Something healthy I do related to physical activity is...” Idea synthesis, a form of qualitative content analysis, identified unique ideas which became the basis of the sorting and rating activities. For sorting, each unique idea was placed on a card and participants (n=50) were instructed to organize the cards into thematic piles and name each pile. For rating, participants (n= 50) were asked to rate on a scale of 1 (0 times/week) to 5 (6-7 times/week) the frequency they engaged in each PA behavior. The groupwisdom™ platform was used to conduct analyses. Similarity matrices, multidimensional scaling, and hierarchical cluster analysis produced a series of interpretable concept maps.

**Results:** A total of 81 statements were generated in response to the focus prompt. From idea synthesis, 27 unique healthy PA behaviors were identified. A six-cluster solution map offered the best conceptual fit. The clusters, listed in order from highest weekly frequency were: (1) Household Chores, 3.05, (2) Work-related PA, 2.36, (3) Outdoor PA, 2.15, (4) PA with Family and Friends, 1.85, (5) Gym-type Exercises, 1.84, and (6) Structured Sport Activities, 1.49. Statements in the Household Chores cluster (i.e., “yard work” and “cleaning and repairing the house”) were reported most frequently. Statements in the Structured Sport Activities cluster (i.e., “play basketball”, “swim”, “practice karate”, “practice boxing,” and “abdominal exercise, like crunches”) had the lowest frequency.

**Conclusion:** The PA behaviors Central American immigrant men identified as healthy represented light, moderate, and vigorous activities. Men engaged in moderately vigorous activities as part of household chores more frequently compared to vigorous activities that were part of structured sport activities. Interventions to increase PA in Central American men should address the challenges of increasing the frequency of activity they already engage in.
Informing Interventions: Parents Thoughts on Messaging to Reduce Young Children’s Sugary Drink Consumption

**Background:** Excess consumption of sugary drinks (SDs) in childhood is linked to the development of obesity and cardiometabolic disease. It is recommended that children under 6 years not consume any SDs. However, in over two-thirds of states across the country, more than half of children ages 1-5 consume at least one SD per week. The DC-SIPPY (Decreasing Young Children’s Sugar Intake through Pediatricians and Social Marketing) project aims to reduce SD consumption and increase water intake among low-income, African American children ages 1-5 years old seen at a pediatric primary care clinic in Washington, D.C.

**Methods:** Parents (n=12) of children ages 1-5 completed a demographic and beverage intake questionnaire, and then participated in an in-depth qualitative interview. During the interview, they were asked to provide feedback about the program concept and to view and provide feedback on 19 prototype graphics, which included 6 DC-SIPPY logos and 13 posts with tips and nutrition education on replacing SDs with water and/or milk. Interviews were recorded, transcribed, and qualitatively coded, after which themes and sub-themes were identified using thematic analysis and will inform subsequent revision to the graphics.

**Results:** Overall, parents’ responses to the DC-SIPPY concept were positive, and they perceived DC-SIPPY as an effective approach for reducing their children’s sugary drink consumption and increasing their water intake. Regarding the design of the graphics, parents appreciated the realistic drinks shown. They commented that the graphics overall could be more eye-catching and colorful. Regarding the messaging in the graphics, parents liked how straightforward they were and felt they learned new information or ideas from viewing them. For example, seeing posts about the amount of sugar in certain drinks or ways to make water more appealing to children were perceived as helpful.

**Conclusion:** The feedback on the DC-SIPPY concept was positive overall and parents’ feedback on specific graphics will be used to refine intervention materials (i.e. social media posts). The intervention content will subsequently be tested in a six-week pilot intervention, which will explore the feasibility and acceptability of the intervention and the perceived effectiveness of the content in promoting behavior change to reduce sugary drink consumption among young children.
Understanding Factors That Influence Parents’ Provision of Beverages to Their Children: A Qualitative Evidence Synthesis

**Background:** Excess consumption of sugar-sweetened beverages (SSBs) is associated with adverse health consequences such as poor oral health, obesity, and development of cardiometabolic diseases. Children’s SSBs consumption significantly exceeds public health recommendations, which is a cause for concern because eating behaviors develop early in life and impact long-term dietary preferences. Understanding psychosocial, cultural and socioeconomic factors influencing children’s beverage intake is important for developing effective interventions; prior literature shows that parents’ perceptions of beverage healthfulness plays a pivotal role in shaping their child’s beverage habits. This qualitative evidence synthesis seeks to elucidate the perceptions and factors that influence parents’ provision of SSBs to their children.

**Methods:** Literature searches conducted in PubMed, Scopus, and CINAHL yielded 1,569 relevant citations. Two researchers screened article titles and abstracts in accordance with the eligibility criteria in a blinded, duplicate method, and discrepancies were resolved by a third team member. 75 articles were deemed relevant and underwent full-text screening. 13 studies met all inclusion criteria, and relevant data were extracted using Covidence. Qualitative findings were independently coded by two researchers using a shared codebook, and additional codes were added as they emerged. Key themes and sub-themes were identified, and representative quotations were selected. The quality of the included studies was independently assessed by two researchers using the Critical Appraisal Skills Programme (CASP) checklist for qualitative studies.

**Results:** Five major themes were identified: 1) factors that influence parents’ provision of beverages to their children; 2) parents’ concerns about SSBs; 3) barriers to limiting children’s SSB consumption; 4) strategies to lower children’s SSB consumption; and 5) parents’ perceptions and limited knowledge of beverage healthfulness.

**Conclusions:** Findings of this qualitative evidence synthesis underscore the need to provide parents with additional guidance about SSBs and more healthful beverage choices, information that should ideally come from trusted members of their community such as doctors, dentists, nurses, and dietitians. Furthermore, while education at an individual level is beneficial, our findings suggest that future interventions should focus on environmental and larger scale policy changes to create infrastructure that addresses the accessibility and affordability of SSBs as well as misleading nutrient and ingredient claims that may further encourage SSB consumption.
ACEing Autism: Identifying Determinants of Fun in Tennis to Improve Health Outcomes for Individuals with Autism Spectrum Disorder

**Background:** Individuals with Autism Spectrum Disorder (ASD), a neurodevelopmental disorder (NDD) that affects as many as 78 million people worldwide, do not get sufficient physical activity. Such low levels of physical activity compound medical conditions often comorbid with ASD, such as obesity, lower bone mineral density, and hyperlipidemia. Along with conferring health benefits, adaptive physical activity programs for individuals with ASD are important because they offer motor benefits (e.g., visuomotor coordination, balance, fine motor coordination) and behavioral benefits (e.g., improved attention and executive function, increased social motivation, decreased repetitive behaviors). One example of an adaptive physical activity program is ACEing Autism, a national nonprofit delivering tennis programming for individuals with ASD. Key to attracting, engaging, and retaining participants in any sport is that it is fun. What makes sport fun has been a growing area of inquiry and studied rigorously in neurotypical individuals. Research has not yet studied the experiences of neurodiverse individuals in adaptive sport programming. The purpose of this study, therefore, was to partner with ACEing Autism to identify determinants of what makes tennis fun for individuals with ASD and other co-occurring NDDs.

**Methods:** Participants included tennis players with ASD (n=63, mean age=11.48) and other co-occurring NDDs, such as attention-deficit/hyperactivity disorder and dysgraphia, and their parents/caregivers, coaches, and volunteers (n=100; mean age=39.45). Players were recruited and participated in person after their weekly tennis programming. Parents/caregivers, coaches, and volunteers were recruited remotely and participated online. They were asked to respond to the focus prompt, "One thing that makes playing tennis fun, for me/players, is..." with as many ideas as came to mind. Idea synthesis, a form of qualitative content analysis, was used to identify unique fun determinants.

**Results:** In total, 563 statements were generated in response to the focus prompt. From idea synthesis, 37 fun determinants that spanned the entire tennis ecosystem were identified.

**Conclusion:** This is the first study to investigate the experiences of fun in neurodiverse individuals participating in adaptive sport programming. What makes tennis fun for players with ASD spans the environmental, physical, verbal, emotional, and social aspects of the tennis ecosystem. Understanding determinants of fun for this population has wide reaching implications for how sport administrators and coaches deliver and shape tennis programming. Future research should identify the fun determinants most important for neurodiverse individuals. Such findings can be used to improve adaptive tennis programs to maximize the immediate and long-term benefits of continued participation.
Metabolic Health is Associated with Fat Oxidation During Exercise in Young Adults

BACKGROUND: The combination of traditional risk factors into a metabolic health score better represents cardiometabolic disease risk than the risk factors alone. Metabolic flexibility is the capacity to respond to metabolic demand and is associated with better health. Maximal fat oxidation during exercise, the highest rate of fat the body can use as fuel and the exercise intensity at which this occurs, are alternative measures of metabolic flexibility.

PURPOSE: To compare measures of metabolic flexibility during exercise in young adults who are metabolically healthy and unhealthy.

METHODS: Young adults (n = 27, 15 females, Age 24 ± 5 yrs., BMI = 27.2 ± 4.5) without overt cardiometabolic pathology completed a graded exercise test on a cycle ergometer to volitional exhaustion. Respiratory gases were measured during the test to assess the rate of fat oxidation during exercise. A third-degree polynomial was used to determine the highest rate of fat oxidation (peak fat oxidation; PFO) and the relative exercise intensity at PFO (PFOREL%). Percent body fat and fat-free mass (FFM) were measured via dual X-ray absorptiometry (DXA). Metabolic health was scored according to five criteria: low cardiorespiratory fitness (VO2peak ≤ 50th percentile); glucose dysfunction (i.e., impaired glucose tolerance during an oral glucose tolerance test (OGTT) or hemoglobin A1c ≥ 5.7%); insulin resistance via Matsuda Index during the OGTT; elevated body fat percentage via DXA; and systemic inflammation (serum C-reactive protein > 1.0 mg/L). People who met two or more criteria were considered metabolically unhealthy. An α = 0.05 was determined a priori. Simple linear regression was used to test the association between metabolic health score and exercise metabolic flexibility.

FINDINGS: Results are presented as mean ± SD. As expected, BMI is significantly higher in young adults who are metabolically unhealthy (29.3 ± 4.6 vs. 24.8 ± 3.2; p = 0.007) without differences in age (22.6 ± 5.5 vs. 24.9 ± 4.0 yrs.; p = 0.443) or fat-free mass (55.2 ± 10.1 vs. 47.4 ± 10.1 kg; p = 0.052). Metabolic health score is not associated with PFO (p = 0.456) or PFOREL% (p = 0.453). When normalized to fat free mass (FFM), metabolic health score is associated with PFO (p = 0.033) but not PFOREL% (p = 0.068).

CONCLUSION: In response to exercise, people with worse metabolic health have a reduced ability to elevate fat oxidation when accounting for skeletal muscle mass, indicating reduced metabolic flexibility during exercise.
Greater Percent Body Fat is Associated with Greater Postprandial Metabolic Flexibility in Young Adults

BACKGROUND: Obesity in young adulthood increases the risk of cardiometabolic disease later in life. Because waking hours are primarily spent in a postprandial state, metabolic assessments after a feeding challenge may better reflect underlying metabolic dysfunction in obesity.

PURPOSE: To compare the postprandial metabolic response to an oral glucose tolerance test in young adults of varying body compositions.

METHODS: Young adults (ages 18-40 y; n = 23, 11 females) without overt pathology completed a glucose tolerance test with indirect calorimetry. Indirect calorimetry was conducted prior-to (fasting) and following (30, 60, 90, 120 min) consumption of a 100g glucose beverage. Serum and plasma were collected at corresponding timepoints and analyzed for blood glucose, insulin, non-esterified fatty acids, and inflammatory markers. Linear mixed models were used to test the effect of body composition on postprandial metabolism over time, while controlling for sex, fasting metabolism, insulin resistance, and the repeated measures design. For sensitivity analyses, we compared results using relative and absolute measures of substrate oxidation (respiratory exchange ratio [RER] and carbohydrate oxidation [CHO]). An α = 0.05 was determined a priori.

FINDINGS: Results are presented as mean ± SD, range. Participants were heterogeneous in their fat mass (23.2 ± 9.3 kg, 9.0 – 41.5), lean mass (52.2 ± 10.5 kg, 39.3 – 76.0), percent body fat (29.2 ± 8.7%, 11.9 – 42.8), visceral adipose tissue mass (0.44 ± 0.41 kg, 0 – 1.46), and relative VO2peak (34.9 ± 9.3 mL/kg/min, 17.4 – 56.3). Postprandial RER increased over time (p < 0.001) and was significantly influenced by fasting RER (p < 0.001), insulin resistance (p = 0.021), and age (p = 0.048). There was a time-by-percent body fat interaction (p = 0.011) whereby greater percent body fat was associated with higher postprandial substrate oxidation. Similar findings were observed for postprandial CHO. Higher percent body fat was associated with greater postprandial blood glucose (p = 0.008) in the adjusted model.

CONCLUSION: Overweight and obesity in young adulthood is a significant risk factor for chronic disease across the lifespan. Contrary to our hypothesis, young adults with greater percent body fat have greater postprandial metabolic flexibility. Despite greater carbohydrate oxidation, blood glucose levels remained higher, suggesting an impairment in glucose disposal with obesity. An understanding of the metabolic derangements underlying obesity in young adults is important to improving identification and treatment of chronic disease.
Validity And Reliability Of A Novel Overhead Load Carriage Screen For Tactical Personnel

Background: Overhead loading of equipment is a common tactical training movement. Many operators are dismissed from training programs due to shoulder injuries exacerbated by limited torso and shoulder complex stability and control.1

Purpose: Determine the validity and reliability of a novel overhead carry screen to assess overhead load carrying capacity.

Methods: Seventeen male (n=11) and female (n=6) resistance trained (>2 yrs, 3d/wk) subjects with overhead loading experience (Mean ±SD: 23.3±3.3yrs, 78.0±12.8kg, 175.5±9.3cm) completed upper body muscular strength and load carriage tests alongside the overhead carry screen (OCS). Subjects were screened for glenohumeral, scapulothoracic, and torso symmetry and function before study inclusion. Upper body strength endurance was evaluated via 10-repetition maximum (10-RM) bench press (BP) and overhead press (OHP) protocols with full inter-set recovery. Relative load ratios from BP and OHP were used to determine OCS loading. The Fundamental Capacity Carry Screen (FCS) and OCS required subjects to complete a 25 ft figure 8 course for maximal distance and time while maintaining standardized postural characteristics. FCS required one maximal effort suitcase-carry with 75% BW load across 2 sandbags. The OCS protocol employed 39% and 47% BW loads using one sandbag held longitudinally overhead and full (10-min) inter-trial recovery. Concurrent validity of OCS load variations was calculated via Pearson correlation with BP, OHP, and FCS outcomes as standards. OCS test-retest reliability, calculated via Pearson correlation, was conducted across two trials in the last session.

Results: Relative load ratios of 39% (OHP/BW) and 47% (OHP/BP) were established for OCS. OCS outcome validity demonstrated moderate correlation with field-based strength measures: OCS_time to OHP/BP (r=0.51), OCS_dist to OHP/BP (r=0.40), and OCS_dist to OHP/BW (r=0.40). OCS test-reliability resulted in strong inter-trial correlation for carry time (p=0.92) and carry distance (p=0.95).

Conclusion: The novel OCS demonstrates high face validity and moderate concurrent validity with established field-based strength tests. Validity results suggest that the OCS assesses variables of strength, function, and control not fully accounted for in current testing methods. Using strength test-based subject inclusion criteria in future research may further solidify novel OCS validity. Critically, the novel OCS demonstrated strong test-retest reliability.

Practical Application: This novel OCS protocol can be reliably used as a pre-training screening tool for shoulder girdle and torso readiness in overhead load carriage scenarios to maximize tactical operator safety and durability.

A Qualitative Exploration of Control, Structure, and Autonomy Support Food Parenting Practices that Hispanic Caregivers Use to Feed Their Preschoolers Healthy Foods

Background: Parents play the role of food models in the lives of their offspring. Healthy eating habits and preferences established at a young age are likely to continue through childhood and into adulthood. Vaughn et al. (Fundamental constructs in food parenting practices: a content map to guide future research. Nutr Rev. 2016.74, 98-117) content map of higher-order food parenting constructs – coercive control, structure, and autonomy support have been limited studied among Hispanic families.

Objective: To explore food parenting practices that female Hispanic caregivers use to feed their 3- to 5-year-old children healthy foods (i.e., fruits, vegetables) in the context of the theoretical constructs of coercive control, structure, and autonomy support.

Methods: Qualitative interviews were conducted in Spanish with Hispanic female caregivers (n=25) via phone or Zoom. Participants elicited thoughts on parenting practices used to feed children healthy foods, family feeding behaviors and preferred sources and methods to receive nutrition education. Audio-recorded interviews were transcribed, translated to English and then content analyzed to identify themes using NVivo v12.

Results: Participants’ mean age was 35.5 ± 6.3 years; 18 were partnered/married (72%) and lived with the child’s father. Caregivers used a variety of feeding strategies to promote preschoolers’ healthy eating, including coercive controlling practices to discipline their children for not eating foods they prepared. Nine themes emerged. Five themes aligned with the constructs of coercive control, structure, and autonomy support described in the literature: threats and bribes, food modeling, food availability, nutrition education, and reasoning. Four themes were new: punishment, preparation and presentation, encouragement and motivation, and responsive feeding. Caregivers discussed using a combination of practices to make their children eat healthy foods. For example, caregivers used rules, motivation, and encouragement to encourage their children to eat healthy foods, but they did not force their children to eat. Married/partnered female caregivers discussed the inconsistent support for healthy eating that the child’s father had by bringing healthy (i.e., fruits, vegetables, milk) and unhealthy (i.e., pizza, popsicles, chips) foods to the home.

Conclusion: Several food parenting practices from the three constructs were present and a few new themes emerged. Caregivers used more autonomy support practices than coercive control and structure practices to feed their children healthy foods.
The L.A.B.E.L. Study: Learning About Beliefs Surrounding “Edulcorantes” (Non-Sugar Sweeteners) Labeling in Brazil

Background: Non-sugar sweeteners (NSS) are commonly found in beverages that children frequently consume, yet there is uncertainty about the health effects of NSS consumption. This is concerning, especially in countries like Brazil, where the new front of package nutrition labeling (FOPNL) for products ‘high in sugar’ is likely to increase the use of NSS in the food supply. This study investigated parents’ perceptions and knowledge about NSS, terminology related to NSS, and how they would like to have information about NSS on packages.

Methods: Seven focus groups with parents and caregivers (hereafter parents) of children between 2-5 and 6-11 years old were conducted in a small- and a large municipality in São Paulo, Brazil. A socioeconomically diverse sample of parents was recruited at public and private schools/early education centers. Focus groups (3-8 participants/group, total n=40) were conducted by a nutritionist and research assistant using a semi-structured guide. Parents were inquired about their understanding of the Portuguese word for NSS (“edulcorantes”) and their perceptions regarding their children's consumption of NSS. Finally, parents were probed to reflect on the healthfulness of NSS compared with added sugars and if and how they would like to have information about NSS on package labeling.

Results: The Portuguese term for NSS, “edulcorantes”, found in the list of ingredients, was not recognized by most parents, especially due to confusion with the term “corantes”, which translates to “food coloring.” Parents indicated having difficulty identifying NSS in beverages and presented divergent opinions about giving beverages with NSS to children and regarding the healthfulness of NSS compared with added sugars. Overall, parents agreed that FOPNL information calling attention to NSS would be helpful, in particular with the statement “not recommended for children,” similar to what has been implemented in Mexico and Argentina.

Conclusions: The term “edulcorantes” was not recognizable to parents of young and school-aged children and they reported difficulties identifying NSS in beverages, suggesting that parents are not aware that the products they provide contain NSS. FOPNL information disclosing the presence of NSS along with the statement they are not recommended for children could help parents identify NSS and make more informed product choices.

**Background:** Nutrition education interventions are more successful when they are part of multicomponent interventions and include tailored messages that support the needs or preferences of the target population. The present study describes the development and process evaluation of nutrition education messages to parents of preschoolers as a complement to a child focused classroom-based nutrition education program delivered by undergraduate students (GW George Reads).

**Methods:** Formative research (*Viera S et al. Hispanic Caregivers’ Preferences for Content, Delivery Methods, and Sources of Nutrition Education from their Child’s Preschool: Qualitative Research Findings, Nutrition and Health, 2023*) we conducted indicated that Hispanic caregivers of preschoolers want to receive nutrition education about healthy foods and appropriate portion sizes to feed their children, strategies to feed fruits and vegetables, and tips to incorporate cultural foods and flavors into healthy meals. Caregivers preferred to receive education in the form of short messages and recipes in print and digital formats and in-person nutrition classes. In fall 2023, 10 short nutrition education messages were developed with feedback from three nutrition content experts. In spring 2024, cognitive interviews (n=3) were conducted in Spanish with Hispanic parents of preschoolers to assess their understanding of messages. Messages were modified based on findings of cognitive interviews and tested for acceptability with the target population. Ten messages plus a link to a food recipe (GW Nutrition Tips) were delivered weekly via ClassDojo, a phone app, to parents of preschoolers in English and Spanish. Messages were concurrently delivered during the duration of the GW George Reads program (10 weeks). To assess parents’ reading of GW Nutrition Tips and/or preparation of the food recipe, they were encouraged to submit a photo of the recipe they prepared by email for a chance to win a $50 gift card.

**Results:** Preliminary findings indicate that while messages received between 170-220 views each week, only one parent submitted a photo of a recipe by week five. To increase parents’ engagement with GW Nutrition Tips, modifications included 1) shortening message length, drawing upon principles of the Health Belief Model, using bold colors and images, and 2) providing a short 3-item survey via ClassDojo to assess parents reading and relevance of the messages as an alternative to submitting a photo of a recipe they prepared.

**Conclusion:** Findings to date seem to indicate implementation and participant responsiveness challenges. Future work includes post-test interviews with parents who viewed the messages to assess program efficacy.
Rooting for Equity: navigating urban agriculture expansion in Washington, D.C. to prevent green gentrification.

**Background:** Participating in urban agriculture (UA) has benefits beyond mental and physical health, with the potential to improve the social, environmental, and economic health of communities. Today, many cities are experiencing revitalization and redevelopment. Areas of urban decay have transformed into green spaces. This phenomenon, known as green gentrification, can lead to the displacement of low-income communities and communities of color. Historically, urban redevelopment has been riddled with inequitable distributions of power and capital. Understanding the harmful implications of UA is imperative for fostering food justice in cities and creating inclusive UA ventures. The purpose of this formative research is to systematically describe policies and practices that promote the equitable expansion of UA, prevent the negative impacts of green gentrification, and identify stakeholders in one case study city (Washington DC).

**Methods:** We conducted a literature review to understand green gentrification in cities in the United States. This research more narrowly focused on UA in Washington DC to understand the current practices and to identify key stakeholders to conduct future in-depth interviews with. Washington D.C. was selected as a case study city as the city aims to expand UA in the District by 20 additional acres by 2032. Stakeholders were identified through expert conversations and through the literature review.

**Preliminary Findings:** We compiled eight articles concerning the inequitable distributions of resources and power within UA and the potential green gentrification impacts. Many disparities exist within the allocation of resources to UA, and most UA programs conformed with a “top-down” structure. UA is often implemented as a solution to food deserts and a lack of services within a community. Many UA projects report land insecurity, prohibitive public policies, inequitable distribution of social and political capital, race and class disparities, and a lack of programmatic and legislative support from the cities as barriers. Utilizing zoning laws, transparent community-led policymaking, offering programming, and providing funding to BIPOC growers were all noted as protective factors against green gentrification. Stakeholder groups identified included affordable housing developers, the DC Office of Urban Agriculture staff, urban farm staff, Advisory Neighborhood Commissioners, building residents, and community leaders.

**Conclusions:** City officials should intentionally engage with community members to inform the creation of equitable policies and practices that prevent green gentrification as a result of UA. Insights from identified stakeholders will be used to inform recommendations for an equitable expansion of UA in DC.
Can water beliefs predict preferred drinking water source? A cross-sectional study in Virginia, USA

**Background:** Approximately half of Americans do not drink water from the tap. Even in the absence of water quality violations, members of the public may not readily trust their tap water. A variety of factors, including perception of water quality and trust in water, may contribute to avoiding tap water.

**Methods:** This analysis used cross-sectional data to investigate the extent to which beliefs about water predict the preferred source of drinking water among 808 adults living in Virginia, USA. Using logistic regression, the odds of drinking tap water compared to bottled water, were compared across individual water beliefs and in a multi-water beliefs model that included: quality and safety of the water from the faucet, trust in the water from the faucet, trust in the water utility provider, awareness that the water utility frequently tests water – all measured on a Likert scale—and considering the local government as a trusted source of information on water (binary). Models were adjusted for relevant demographic covariates.

**Results:** Respondents were mostly homeowners (60%), white (72%), and college graduates (49%). About 54% of participants indicated that their preferred source of water was tap water, and more than two thirds of participants rated water beliefs in the top half of the Likert scale. In the adjusted regression, the largest increase in odds of drinking tap water was for those with the highest levels of trust in water at the faucet, followed by those that rated their tap water quality as excellent, rated their tap water as very safe, had a lot of trust in the water utility, and finally those who considered the local government a trusted source for information. In the multi-water beliefs model, trust in the water at the faucet was the only water belief that significantly increased the odds of choosing tap as the preferred source of water, where levels of trust were “not at all/not too much”, “some”, “a lot”, or “I don't have an opinion”. Compared to those that reported not too much/no trust at all, those that had a lot of trust (OR: 2.34; 95% CI: 1.23-4.49; \( p = 0.01 \)) had higher odds of preferring water directly from the faucet.

**Conclusion:** These findings illustrate that there is a gap between having positive water beliefs and preferring tap water, and highlight the need to identify factors that can be targeted, in conjunction with trust, to develop interventions to increase tap water consumption.
Significantly Elevated Serum Leptin But Not Traditional Clinical Risk Factors In Young Adults with Insulin Resistance

BACKGROUND: Insulin resistance is a key factor in several cardiometabolic diseases. Higher leptin and C-reactive protein (CRP) have also been associated with cardiometabolic disease. In a clinical setting, blood lipid measures and HbA1C are used screen for disease.

PURPOSE: To compare metabolic profiles of young adults with and without insulin resistance.

METHODS: Young adults (n = 24, 12 females, Age 24 ± 5 yr, BMI = 27.2 ± 4.5) without overt cardiometabolic pathology were recruited to participate. Insulin resistance was calculated as the Matsuda Index using blood glucose and serum insulin values from an oral glucose tolerance test; individuals were categorized as insulin resistant with a Matsuda Index < 3.0. Whole blood was used to determine blood glucose, HbA1C levels, total cholesterol, HDL, LDL, and triglycerides. Serum was used to determine insulin, leptin, and CRP levels via enzymatic assay. An α = 0.05 was determined a priori. Groups were compared using a Student’s T-test.

FINDINGS: Results are presented as mean ± SD, range. As expected, young adults categorized as insulin resistant had significantly lower Matsuda Index Scores (2.3 ± 0.6 vs. 6.6 ± 2.9; p < 0.001) and significantly higher BMIs (29.5 ± 4.9 vs. 25.3 ± 3.2; p = 0.02) and body fat percentages (36.6. ± 5.7% vs. 25.6 ± 7.7%; p = 0.001) as compared to those without insulin resistance. There were no significant differences between standard clinical measures of total cholesterol (p = 0.07), HDL (p = 0.05), triglycerides p = 0.27), LDL (p = 0.16), HbA1C% (p = 0.82), inflammation (CRP; p = 0.53), or fasting blood glucose (p = 0.72). Individuals with insulin resistance had significantly higher serum leptin (226.4 ± 111.0 pg/ml vs. 75.4 ± 45.2 pg/ml; p < 0.001) as compared to those without insulin resistance.

CONCLUSION: When compared to young adults without insulin resistance, young adults with insulin resistance have higher serum leptin levels and greater adiposity. However, traditional clinical risk factors are not altered in this population.
Ultra-processed food consumption is associated with frailty among men and women 65 years and older: Findings from the InCHIANTI Study

Background: Over half of the daily energy intake consumed by adults 60 years and older is from ultra-processed foods (UPFs). UPF consumption is associated with an elevated risk of inflammation and a higher level of oxidative stress, both of which are important risk factors for frailty. Frailty is a clinical syndrome in older adults that carries an increased risk for poor health outcomes. In this cross-sectional study, we examined whether UPF consumption was associated with frailty in a population of older adults.

Methods: These analyses were conducted using baseline data from 938 participants aged 65 years and above from the InCHIANTI study. Dietary intake information over the past year was obtained using a validated food frequency questionnaire. UPFs were categorized using the NOVA classification system, which considered the nature and extent of the processing of foods. Quartiles of UPF consumption were computed using energy-adjusted residuals. The highest quartile (T4) represented the highest frequency of UPF consumption, while the lowest quantile (T1) indicating the lowest frequency of UPF consumption, served as the reference group. Frailty was operationalized as frailty index (FI) and computed as the ratio of the sum of 42 variables representing health deficits and functional domains to the total number of non-missing components. FI ranges from zero to one, indicating no frailty to severe frailty. Baseline FI was the primary outcome of this analysis. A multivariable linear regression model was used to examine the cross-sectional association between UPF consumption quantiles and FI, adjusting for age, sex, body mass index, total energy intake, education years, and smoking status.

Results: The mean age of the study cohort was 74 years (SD=6.6) with 55% being women. Higher UPF consumption was significantly associated with higher FI scores. The highest UPF consumption quartile (T4) was associated with an increment of 0.028 points in the baseline FI score (95% CI: 0.013-0.044, p-value<0.001).

Conclusion: Higher UPF consumption in older adults was associated with frailty, suggesting that the nature and extent of food processing play a crucial role in health outcomes.

Implications: These findings add to the growing evidence of the detrimental role of UPF intake on human health. While longitudinal studies need to confirm these findings, moderation of UPF intake may be warranted for the overall well-being of older adults and to promote healthy aging.
Life style intervention reduces plasma branched-chain amino acid concentrations: an analysis of data from the PREMIER study

**Background:** Elevated plasma branched-chain amino acids (BCAA), including isoleucine, leucine, and valine, are associated with insulin resistance and a higher risk of type 2 diabetes and cardiovascular diseases, prompting investigations into the impact of lifestyle factors on BCAA metabolism.

**Methods:** Participants were randomized into three different intervention groups: advice-only (n=242), the established intervention group with behavioral lifestyle counseling (n=232), and the ‘established lifestyle+DASH’ group with behavioral lifestyle counseling plus counseling for Dietary Approaches to Stop Hypertension (DASH) dietary pattern (n=239). We analyzed data on changes during the interventions in 713 participants of the PREMIER trial who were US adults with elevated blood pressure. Nuclear magnetic resonance spectroscopy was used to measure plasma BCAA levels. Fitness levels were determined using the maximum heart rate during treadmill test. Multivariable linear regression analysis was used to examine the association between plasma BCAA concentration and intervention groups, change in BMI, and change in fitness levels with adjustment for age, sex, race, region, marital status, education level, and smoking.

**Results:** During the 6 months intervention, the total plasma BCAA concentration (mmol/L) did not change significantly in the advice-only group, but decreased from 0.45 to 0.43 (p=0.002) in the established lifestyle group, and from 0.46 to 0.44 (p<0.001) in the established lifestyle+DASH group. Compared with the advice-only group, plasma BCAA levels decreased in the established lifestyle (β -0.011 mmol/L; SE 0.0065; p=0.081) and the established lifestyle+DASH (β -0.017 mmol/L; SE 0.0065; p=0.008) groups. Changes in BMI during the trial were not significantly associated with changes in plasma BCAA concentration. In contrast, increased fitness was associated with decreases in the plasma BCAA concentration (β 0.00075, SE 0.00026, p=0.004).

**Conclusion:** A behavioral lifestyle intervention consisting of physical activity, a healthy dietary pattern, and modest weight loss substantially reduced plasma BCAA levels. Improvements in fitness rather than weight loss were associated with decreases in plasma BCAA concentrations. Further investigation is being conducted to explore additional factors influencing plasma BCAA levels, including specific dietary patterns.
A Policy Landscape Analysis of Food System Investments Using Coronavirus State and Local Fiscal Recovery Funds

**Background:** The COVID-19 pandemic worsened persisting inequities throughout urban food systems, disproportionately impacting socially and financially marginalized families with children and food system actors. Municipal governments are vital to advancing nutrition equity in urban food systems through reimagining policies, systems, and environments that promote the nutritional well-being of families with children from the points of food production and distribution to consumption. Today, many municipalities are leveraging financial resources made available through the Coronavirus State and Local Fiscal Recovery Funds (SLFRF) for this purpose. This research catalogs and describes the SLFRF food system investments made in large cities in the United States.

**Methods:** A systematic web-based search was conducted in February and March 2024 using the publicly available SLFRF investment tracker, a comprehensive portal managed by the U.S. Department of Treasury that is updated quarterly by recipient governments. Cities with a population size of over 750,000 were included (n=18). Once a food system investment was identified as eligible, information was systematically gathered from additional non-governmental databases, press releases, government program websites, and reliable news articles following a protocol modeled from similar reviews of policy responses.

**Results:** Across the 18 largest cities in the United States, a total of 93 food system investments were cataloged. On average, a city had 5 investments, with 3 cities having no food system investments. Funding allocated to investments ranged from $0 to over $200 million for a given project, with an average of $10.8 million. Of the projects cataloged, only 14% have been completed and the majority remain less than 50% completed. Over ⅓ of food systems investments (n=35, 37%) were focused on underrepresented populations (BIPOC/low-income/homeless). The majority (n=47, 50.5%) of food system investments made by the largest cities in the United States were focused on providing individual-level food support (e.g. financial assistance for food or direct food aid).

**Conclusions:** The SLFRF allowed for a vast range of financial investments to be made into urban food systems with many cities focusing on both underrepresented populations and individual-level food support. Additional research is needed to evaluate the potential for these investments to advance nutrition equity in urban food systems.

Introduction: The most recent 2018 Physical Activity Guidelines for Americans promotes 150 min/week or more of moderate-intensity aerobic physical activity, as well as two bouts of muscle strengthening activity/week. Unfortunately, only a small proportion of adults meet both of these recommendations, and it is not clear whether the COVID-19 pandemic disrupted physical activity patterns even further. National surveillance data were used to examine two-year trends in reported physical activity across several different sociodemographic subgroups of adults living in the United States.

Methods: The National Health Interview Survey (NHIS) uses geographically-clustered sampling techniques to ensure a nationally-representative study sample. Data specific to physical activity were collected from adult (≥18 y) respondents early in the pandemic of 2020 (n=31,568) and then, again, later in 2022 (n=27,651). Survey-weighted physical activity [min/week of moderate- (MPA) and vigorous- (VPA) intensity] were compared between 2020 and 2022 according to sex, race, age, educational attainment, and geographical location using regression modeling. The prevalence of meeting the Physical Activity Guidelines was compared between surveys, according to these same sociodemographic variables using logistic regression modeling. All statistical analyses were conducted with Stata BE 18.

Results: Between 2020 and 2022, minutes of MPA increased from 236±333 to 249±376 min/week (p<0.001), while VPA increased from 147±256 to 151±296 min/week (p<0.001). These observed increases in MPA and VPA were greater in men than in women (p<0.001) and greater among non-Hispanic black and Hispanic respondents, than in non-Hispanic white respondents (p<0.001). Two-year increases in both MPA and VPA were also significantly greater in those with ≤12 years of education, compared with those of higher educational attainment (p<0.001), while increases in MVP (but not VPA) were greater in adults 18-33 years, compared with older respondents. In both 2020 and 2022, only 24% of Americans met both the aerobic and the muscle strengthening recommendations, and this low prevalence was particularly pronounced in people over age 65 years and in those with low educational attainment or living in rural areas.

Discussion: The observed increasing trends in MPA and VPA following the COVID-19 pandemic are encouraging; however, these increases were not equally distributed across sociodemographic subgroups. Moreover, even though the overall small proportion of Americans meeting both aerobic and muscle strengthening recommendations remained unchanged, this prevalence also varied markedly by subgroup. These findings suggest that greater resources are still needed to promote an active lifestyle for all Americans.

Word Count: 391/400
Influence of Live-in Female Partners on Adult African American and Hispanic Men’s Engagement on Healthy Food and Physical Activity Behaviors: A Scoping Review

**Background:** Support from a romantic partner can be an important facilitator to engage in healthy behaviors among men. Few studies have reported on the role of live-in female partners on minority men’s diets or physical activity. This study aimed to review the literature to identify the influence of live-in female partners on African American and Hispanic men’s engagement in food and physical activity (PA) behaviors.

**Methods:** The study reviewed the relevant literature to identify factors related to the influence of a live-in female partner (i.e., spouse, wife) on adult (>20 years) heterosexual African American and Hispanic men’s behaviors as related to healthy foods and PA. Articles included in this review were extracted from The Cumulative Index to Nursing and Allied Health Literature (CINAHL), Scopus, and PubMed through a review of the literature from December 2023-February 2024. Covidence software was used for screening and data extraction, and we followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) format for data reporting. A priori, we tested key words related to live-in female partner influence on African American and Hispanic men’s food choices and PA found in the Medical Subject Headings Library (http://www.nlm.nih.gov/mesh/) by conducting mock searches to ensure that the final list of terms was captured in articles that met inclusion criteria. The study inclusion criteria were: peer-reviewed papers, studies in which the sample included adult African American or Hispanic men and live-in female partners. We did not place limitations on the dates of publication or study design in the search. Review papers, editorials, commentaries, or meeting abstracts were excluded. Only articles written in English and studies that were conducted in the US were included. Searches were uploaded in Covidence. After all duplicates were removed, three reviewers (K.L., S.P. and A.B.) independently conducted title and abstract screening to check for inclusion criteria, compared data, and resolved discrepancies. The Review Board determined that the study did not require review for human subject research.

**Results:** The present study reports preliminary findings of a review of the literature. In total, 2,413 articles’ titles and abstracts were initially screened; 74 articles were read for full text review. 43 studies were quantitative, 23 were qualitative, and 8 were mixed methods studies.

**Conclusion:** No previous review of the literature has focused on the unique role of the live-in female partner on minority men’s engagement in healthy food choices and PA behaviors. Findings may elicit specific behaviors that female partners use to catalyze men’s engagement in healthy behaviors towards the development of gender- and culturally-sensitive health promotion interventions in African American and Hispanic adult men.
Young Adults with Low Serum Adiponectin Have Altered Resting Metabolism and Postprandial Metabolic Flexibility

**BACKGROUND:** Adiponectin, a circulating protein hormone secreted by adipocytes, regulates metabolic processes by enhancing insulin sensitivity, reducing inflammation, and modulating metabolism. Dysregulation (i.e. low serum values) of adiponectin is associated with overweight, obesity, and metabolic disorders.

**PURPOSE:** To compare measures of resting and postprandial metabolism in young adults with low serum adiponectin.

**METHODS:** Young adults (n = 25, 12 females, Age 24 ± 5 yr, BMI = 27.2 ± 4.5) without overt cardiometabolic pathology completed an oral glucose tolerance test (OGTT). Serum adiponectin was determined on fasting serum samples collected after a 10 hour overnight fast. Individuals with serum adiponectin values < 4500 ng/ml were considered to have Low Adiponectin. Metabolic rate, and other indices of metabolism, were determined via indirect calorimetry prior-to (fasting) and following (30, 60, 90, 120 min) consumption of a 100g glucose beverage. Insulin resistance was calculated as the Matsuda Index. An α = 0.05 was determined a priori. Groups were compared using a Student’s T-test.

**FINDINGS:** As expected, young adults with Low Adiponectin had significantly lower serum adiponectin (3560 ± 658 ng/ml vs 6416 ± 2091 ng/ml; p = 0.001) and significantly higher total body mass (87.3 ± 16.7 kg vs. 72.3 ± 13.4 kg; p = 0.02) as compared to those with normal values. Individuals with Low Serum Adiponectin had similar Age (25 ± 5 yrs vs. 23 ± 6 yrs; p = 0.37), BMI (28.8 ± 4.9 vs. 25.6 ± 3.5; p = 0.06), body fat percentage (30.4 ± 9.4% vs. 29.7 ± 8.4; p = 0.85), fasting blood glucose (101 ± 6 mg/dl vs. 95 ± 18 mg/dl; p = 0.26), fasting serum insulin (16.1 ± 95 ul/ml vs. 12.7 ± 7 ul/ml; p = 0.31), and insulin resistance (Matsuda Index = 4.0 ± 2.4 vs. 5.6 ± 3.2; p 0.19). Individuals with Low Adiponectin values had significantly higher rates of carbohydrate oxidation at rest (0.139 ± 0.066 vs. 0.075 ± 0.064; p = 0.02) and lower postprandial change in respiratory exchange ratio (delta RER = 0.01 ± 0.04 vs. 0.05 ± 0.04) indicating altered resting metabolism and postprandial metabolic flexibility.

**CONCLUSION:** Young adults with low serum adiponectin exhibit altered resting metabolism and impaired post-prandial metabolic flexibility, despite not displaying overt metabolic diseases. Additionally, those in the Low Adiponectin group may have greater risk for future metabolic disorder which highlights the importance of monitoring adiponectin levels when assessing metabolic health.
GWSPH RESEARCH SHOWCASE
EXERCISE AND
NUTRITION SCIENCES

Young Adults with Elevated Inflammation Demonstrate Mostly Normal Blood Glucose Homeostasis and Glucose Tolerance

BACKGROUND: C-Reactive Protein (CRP) is a marker of systemic inflammation that is elevated in individuals with cardiometabolic disease. Early identification of at-risk young adults allows for rapid lifestyle interventions with the ability to reduce progression to pathophysiological cardiovascular processes.

PURPOSE: To compare measures of blood glucose homeostasis, glucose tolerance, and insulin resistance in young adults with and without elevated systemic inflammation.

METHODS: Young adults (n = 23, 12 females, Age 24 ± 5 yr, BMI = 27.2 ± 4.5;) without overt cardiometabolic pathology completed an oral glucose tolerance test (OGTT). Inflammatory status (C-Reactive Protein; CRP) was determined using fasting serum samples; CRP values > 0.5 mg/L were considered to have elevated inflammation. Blood glucose was monitored prior-to (fasting) and following (Post-30, 60, 90, 120 min) consumption of the 100 g glucose beverage during the OGTT. Hemoglobin A1C was determined using whole blood from fasting samples. Glucose tolerance was determined by comparison of Post-60 and Post-120 minute blood glucose values. Insulin resistance was calculated as the Matsuda Index using blood glucose and serum insulin values from the OGTT. An α = 0.05 was determined a priori. Groups were compared using a Student’s T-test.

FINDINGS: Results are presented as mean ± SD. As expected, young adults with elevated systemic inflammation had significantly higher CRP (1.47 ± 1.2 mg/L vs. 0.27 ± 0.13 mg/L; p = 0.001). Individuals with elevated systemic inflammation were of similar (p > 0.05) Age (24 ± 6 vs. 23 ± 5), BMI (27.4 ± 4.5 vs. 26.7 ± 4.4); and body fat percentage (30.7 ± 6.6 vs. 29.4 ± 10.4) as compared to those with normal inflammation. Individuals with elevated systemic inflammation had similar fasting blood glucose (HbA1C = 4.9 ± 0.42% vs. 5.3% ± 0.67%; p = 0.14) and insulin resistance (Matsuda Index = 4.78 ± 3.4 vs. 5.1 ± 2.7; p = 0.78) as compared to individuals with normal inflammation. Individuals with systemic inflammation had similarly higher blood glucose at Post-60 (136 ± 33.4 mg/dl vs. 112 ± 21.3 mg/dl; p = 0.03) during the OGTT indicating altered glucose tolerance. There was no difference in blood glucose at Post-120 (p = 0.87).

CONCLUSION: Though individuals with inflammation show altered glucose tolerance during the OGTT, it does not meet the clinical definition of impaired. The CRP threshold 0.5 mg/L may not be strict enough to identify altered blood glucose homeostasis in young adults.
Schools as Hubs for Food Education and Access: An Experiential Food Education Program Evaluation

Background
School-based experiential food education programs are a popular strategy for equipping children to navigate a complex food system. The FRESHFARM FoodPrints program promotes the development of healthy and sustainable food behaviors through hands-on experiences with fresh food and local food systems for elementary school children and trained service learners, who are an integral part of program delivery. The program’s innovative model connecting education, food systems, and the community offers an opportunity to examine impact on food behaviors of children and service learners and identify pathways for dissemination of food education and access from schools into the broader community.

Purpose
This 2-year study is examining program impact on 1) food literacy (FL) and fruit and vegetable (FV) consumption among children and service learners, and 2) service learner food and agriculture career interests. A process evaluation is also being conducted to contextualize program implementation over the study period.

Methods
Children in 4th and 5th grade at n=6 partner schools and program service learners are being recruited during the Fall of 2023 and 2024. Baseline and follow-up measures of FL and FV consumption is being measured via questionnaire at Fall and Spring visits in each study year. Separate FL questionnaires for children and service learners were developed collaboratively with the program partner from peer-reviewed frameworks. A modified, validated food frequency questionnaire is being used to measure FV consumption in all participants. Perceived growth in leadership skills and interest in food and agriculture careers among service learners will be assessed via questionnaire at the end of their service. Metrics to assess dose, reach, fidelity, participant satisfaction, and progress toward program objectives are being collected in the process evaluation.

Implementation Progress
As of March 2024, 70 students at 6 elementary schools and 22 service learners participated in baseline data collection, and process evaluation metrics from the first semester have been collected. Year 1 data analysis will take place after Spring follow-up data collection.

Implications
Findings will provide insight into program impact on both children and service learners’ food behaviors through FL and FV consumption and the incorporation of food and agriculture into service learners’ career planning. Process evaluation metrics will indicate progress toward program goals to expand the reach of food education and access through school-day programming, cafeteria connections, and farm stands. Study results will be used to identify both current program strengths and opportunities for increased school-home-community food connections that promote health and sustainability among partner school communities.
A concept mapping application toward sustaining junior players’ participation in tennis: Comparison across sex, age, & skill level

**Background:** The United States Tennis Association’s (USTA) American Development Model (ADM) aims to provide clear, stage-based pathways for skill development, facilitated by quality coaching, training, and competition experiences that are fun and athlete-centered. What makes tennis fun has been an area of recent investigation. A study of junior tennis players, ages 6-19, discovered having fun included 11 overarching factors (i.e., match play, positive coaching, working hard and learning, developing mental strength, staying active, sportsmanship, training with coach, ways of playing, hitting the ball, skill building, and bonuses) that were defined by 120 precise fun determinants (Visek et al., 2023). Designing play and practice activities that are fun is among the foremost important evidence-based recommendations for motivating and sustaining youth athletes’ participation in organized sport (Cote & Hancock, 2014). Therefore, the objectives of this study were to conduct a cross-sectional, participant subset analysis of Visek et al.’s extant data, consistent with the ADM, to explore what makes tennis most fun as a function of junior players’ biological sex, age, and skill level.

**Methods:** The participant subset included junior tennis players (n=304, 132 girls, 172 boys, age=12.17±3.21 y), who had rated the importance of the 120 fun determinants on a Likert-type scale from 1 (not important) to 5 (extremely important). To compare subgroups across the 11 factors and 120 determinants, pattern match displays and go-zone displays were generated using groupwisdom™. R was used for descriptive statistics and to conduct tests of significant group differences.

**Results:** Participants were highly similar in their reported importance of the 11 fun factors, regardless of sex (i.e., girls’ v boys’ r=.96), age (younger v older, r=.91), and skill level (modified v regulation equipment players, r=.85), with no to few significant differences. Comparisons across the 120 fun determinants also indicated high similarity among girl v boy players (r=.93), younger v older players (r=.86), and modified v regulation equipment players (r=.82), with one, 19, and 29 significant differences observed, respectively. Effects sizes of difference were generally small (≤0.21).

**Conclusion:** Efforts to attract, engage, and retain players in tennis is dependent on them having fun. What makes tennis fun is largely the same across junior players, regardless of sex, age, or skill level. Where differences were observed, the magnitude of difference was small, indicating greater similarity than differences. When making fun a focal point in tennis programming, these findings suggest de-essentializing differences across the USTA ADM’s stage-based, athlete development pathways.
Formative research to develop “DC-SIPS,” a multi-level intervention to reduce sugary drink intake and promote water intake among African American youth in Washington, D.C.

**Background:** Children’s consumption of sugary drinks (SD) considerably exceeds public health recommendations, particularly among African American adolescents from low-income households. However, few interventions have specifically focused on reducing SD intake in this population. The purpose of this study was to conduct formative research to develop DC-SIPS (Decreasing Children’s Sugar Intake Through Pediatricians and Social Marketing), a multi-level intervention to reduce SD consumption and increase water intake among low-income, Black adolescents seen at a pediatric primary care clinic in Washington, D.C.

**Methods:** In-depth, qualitative interviews with pediatricians (n=6), children ages 11-14 years old (n=17), and their parents (n=13) were conducted to obtain feedback on the intervention concept and prototype DC-SIPS branding and messaging. Components of the social ecological model, social cognitive theory, and message effects theory were utilized to develop preliminary materials and semi-structured interview guides. Interviews were recorded and transcribed, and data were analyzed using thematic analysis.

**Results:** Pediatricians, children, and parents expressed enthusiasm for DC-SIPS and provided suggestions to refine the intervention concept and improve branding. Pediatricians described key facilitators of the concept including feasibility of SD reduction counseling and the popularity of social media. Children and parents emphasized the need to enhance visual aspects of the social media content through the addition of more vibrant colors, playful fonts, and consistent branding. The use of incentive-based challenges as a strategy to promote engagement with the program was also suggested by pediatricians, children, and parents.

**Conclusion:** Findings of this formative research informed refinement of prototype DC-SIPS content and development of additional messaging content. The feasibility and acceptability of the refined and newly developed content consistent with participant feedback will be tested in a six-week pilot intervention. Additional factors, such as the perceived effectiveness of the content in promoting behavior change, will be evaluated to inform further refinements to DC-SIPS with the long-term goal of investigating the efficacy of DC-SIPS in a larger-scale randomized controlled trial.
Associations of age, body mass index, diabetes and hypertension with relative dose intensity among women receiving anthracycline- and/or taxane-based chemotherapy for invasive breast cancer

Chemotherapy relative dose intensity (RDI) > 85% has been associated with greater tumor response to treatment and longer survival in women with breast cancer. Research suggests that medical comorbidity is associated with reduced RDI. We aimed to determine factors associated with RDI of specific chemotherapy drugs in anthracycline- and/or taxane-based regimens.

Women with a diagnosis of invasive breast cancer who received chemotherapy with either doxorubicin (DOX) + paclitaxel (PAC) or docetaxel (DOCE)-containing regimens at GWU Hospital from 2012 to 2019 were included in this retrospective study. Age, race, comorbidities, height, weight, and chemotherapy regimen and dose were abstracted from the electronic health record. BMI was calculated using height and weight measured in clinic when initial chemotherapy orders were written and categorized according to US national guidelines (18.5 to <25, 25 to <30, and >30kg/m²). Presence of diabetes (DM) and hypertension (HTN) at time of diagnosis were determined by chart review. The oncologists’ initial chemotherapy dose and duration orders were used for RDI calculations. Cumulative actual dose received and duration of treatment were compared to planned dose and duration for individual chemotherapy drug and by regimen (DOX+PAC vs. DOCE). Associations between patient characteristics and RDI were evaluated in bivariate and multivariable analyses.

A total of 230 women met inclusion criteria. A higher percentage of women on DOX+PAC received >85% RDI compared to women receiving DOCE (80.8% vs 67.6%). Women aged 65+ years had lower median RDI [IQR] for DOCE than younger women (0.83 [0.67 - 0.98] vs 0.94 [0.84 - 1.00]). Median RDIs of PAC and DOX+PAC were lower for Black women than for White and Asian women (PAC: 0.91 [0.75 - 1.00] vs 1.00 [0.89 - 1.00], DOX+PAC: 0.92[0.87-0.99] vs. 0.97 [0.91-1.00]). BMI category was associated with median RDI for PAC (p= 0.03) and DOX+PAC (p = 0.01), with women in the >30kg/m² category having the lowest median RDIs and PAC RDI >85% (p < 0.01). Median RDI of DOX+PAC was lower for women with DM (0.89 [0.84-0.92] vs. 0.96 [0.88-1.00]). Median RDI was lower among women with HTN compared to women without for PAC (0.85 [0.73 - 1.00] vs 0.98 [0.83 - 1.00]) and DOX+PAC (0.91 [0.84 - 0.97] vs 0.97 [0.90 - 1.00]).

Our findings of associations between increasing age, Black race, BMI, DM, and HTN and reduced RDI are consistent with prior research and present new data regarding associations between medical comorbidities and individual chemotherapy regimen components.
Global Health
GWSPH RESEARCH SHOWCASE  
GLOBAL HEALTH

A CROSS-SECTIONAL STUDY EXAMINING WHETHER MINIMUM ACCEPTABLE DIET MEDIATES THE RELATIONSHIP BETWEEN BREASTFEEDING AND STUNTING IN CHILDREN 6-23 MONTHS OF AGE IN PAKISTAN

**Background:** Stunting is an on-going, serious concern in Pakistan, with 56% of children stunted, out of which 17% are severely stunted. Nationally, only 13% of children ages 6-23 months in Pakistan receive MAD, which ensures proper growth1 and contributes to undernutrition if not met. Previous studies have shown that risk factors associated with childhood stunting in Pakistan include older maternal age, maternal smoking, small size of child at birth, low SES, primary or no maternal education; whereas, proper breastfeeding practices and milk consumption are among the protective factors against stunting. According to the most recent data on nutrition from Pakistan’s Demographic and Health Survey (PDHS), breastfed children in Pakistan between 6-23 months of age have a higher intake of minimum acceptable diet (MAD) than their non-breastfed counterparts. Looking at the current literature on the influence of maternal characteristics on breastfeeding practices and MAD intake in children 6-23 months of age in Pakistan, it is evident that odds for exclusive breastfeeding are lower among urban mothers, those with higher SES, and those with a secondary or higher education, but mothers with the same characteristics are more likely to provide MAD to their children. Nonetheless, there seems to be a gap in literature on how EBF, MAD, and child/maternal characteristics connect and possible interact with each other, which shows that there is a dire need to study these variables in more depth and their collective effect on stunting among Pakistani children.

**Study Significance:** Primary aim of this study is to reduce the incidence of childhood malnutrition which is on the causal pathway to stunting and infant mortality in Pakistan. Therefore, the main research question is whether minimum acceptable diet (MAD) mediates the relationship between breastfeeding and stunting in children 6-23 months of age in Pakistan?

**Methods:** The proposed study will be conducted using a descriptive/non-experimental, cross-sectional study design using survey sample designs with secondary analysis to be performed on Pakistan Demographic and Health Survey (PDHS) 2017–2018 data, a nationally representative survey, which uses household survey questionnaire to collect information on household socio-demographics, nutrition, and maternal and child health indicators. Study population consists of a sample size of 3,404 children, divided among breastfed and non-breastfed categories. The exposure is breastfeeding status, the mediator is MAD intake, and the outcome is stunting, with maternal and child characteristics as potential confounding variables. A multivariable logistic regression model will be fit to explore the association between MAD, breastfeeding, and stunting, in addition to univariate and bivariate analyses.

**Results:** Of the 3404 children, 51.41% of children were males and 48.59% were females. About two-thirds or 64% of these children were breastfed, while 36% were not. Out of these, only about 10.8% among breastfed and 2.5% among non-breastfed children receive MAD, while most did not. Outcome distribution showed that about 29% of children in the sample size are stunted, while 71% are not.

**Conclusions:** Although the regression analyses did not show stunting to be statistically significantly correlated to breastfeeding and MAD, both breastfeeding and MAD were statistically significantly correlated to each other. Odds ratio shows that breastfeeding children have 2.5x the odds of achieving MAD than non-breastfed children. So breastfeeding is necessary to achieve MAD. Lower levels of stunting were found among non-breastfed children despite them having lower MAD intake than their breastfed counterparts. Overall, this study aims to increase national levels of MAD by incorporating breastmilk in daily diet and encouraging breastfeeding practices among urban and educated mothers to combat national levels of stunting and overall childhood mortality in Pakistan.
Pediatric Meningitis in Saudi Arabia: Vaccination Success and Antibiotic Resistance!

**Introduction:** Saudi Arabia had high rates of bacterial meningitis in the late 90s. Given it is the melting pot for many Muslims, the country suffers this risk annually. Children are at highest risk of this devastating disease with poor outcomes. Then, mass immunization programs were implemented successfully in hope of countering this serious illness in the early 2000.

**Objective:** Examine the prevalence and etiologies of pediatric meningitis in one of the tertiary hospitals in the capital city, Riyadh, Saudi Arabia 15 years after successful mass immunization against meningococcus, pneumococcus, and Hemophilus influenza type B (Hib). Similarly, understand some risk factors and emerging antibiotic resistance.

**Methodology:** Single-center retrospective chart review was conducted at King Saud University Medical City (KSUMC) from 2015 to 2023. The review included all cerebral spinal fluid (CSF) culture results of the study period along with demographic data of all patients included.

**Result:** Reviewing 8 years of CSF culture results only yielded 38 cases in a major tertiary hospital in Riyadh. This is only 0.5% of total hospital admissions to KSUMC over 8 years. The majority of cases were for children under the age of 2 years (77%). Actually, 55% of all cases were for infants. Gender of cases was equally distributed (males 52% and females 48%). There was no seasonal variation and pediatric meningitis happened all year long. There was a high contamination rate with 12 cases considered contaminates (32%). The most common organisms were gram-positive (12, 32%) including Group B streptococcus (4, 10.5%), staphylococcus aureus (5, 13%), and streptococcus pneumonia (3, 8%). Gram-negative organisms were caused by different organisms and only 6 cases (15%). Four of the staphylococcus aureus cases were MRSA and 3 gram-negative organisms were multi-drug resistant (E. Coli, Enterobacter cloacae and Citrobacter sedlakii). Most children had full recovery after bacterial meningitis with only 6 cases developing complications. The most common complication was seizures.

**Conclusion:** Saudi Arabia’s effort to lower the burden of meningitis is very successful through mass immunization programs. Compared to 90s profile of cases, there is no reported cases of Hib or meningococcus. Future efforts should focus on antibiotic stewardship, Group B streptococcus screening, and adopting additional strains for the pneumococcus vaccine. Hand washing and sterilization should be reinforced to minimize contamination upon pediatric meningitis investigation.
Childhood Asthma and Consanguinity: Is There a Relationship? Maybe A Systematic Review Can Answer

**Background:** Asthma is the most common chronic disease among children. It is a complex disease caused by interactions of environmental and biological factors. Furthermore, it runs in families suggesting genetic component of this multifaceted pathology. Recently, childhood asthma has been linked to genetic causality pathway.

**Objective:** To explore the available literature to understand possible links between childhood asthma and consanguinity.

**Methodology:** Literature review of all possible published English articles addressing links between childhood asthma and consanguinity happened through four search engines (PubMed, MEDLINE, Google Scholars, and Cochran Review). Non-English articles and unpublished data were not included. Two paired reviewers conducted title screen then abstract review. Later, full article screen was done to decide on inclusion or exclusion. In case of conflict between reviewers, principal investigator was able to resolve this conflict with a final decision.

**Results:** Using over 25 keywords yielded over 5000 articles. After removing duplicates and title screen, 1500 articles were chosen for abstract review. Next, the abstract review shortens the list of articles to less than 300 articles. A full manuscript review produced 15 articles discussing links between childhood asthma and consanguinity. All studies except one found a positive correlation between childhood asthma and consanguinity. Children born to consanguineous parents are more likely to have asthma. Furthermore, asthma severity can be highly impacted by consanguinity. Consanguinity can put a child at risk of severe asthma. The lone study that failed to establish a correlation between childhood asthma and consanguinity was a case-control design and lacked proper matching. Additionally, the study did not comment on the consanguinity rate among controls.

**Conclusion:** Consanguinity and childhood asthma are positively correlated. This well-established connection can impact the incidence and severity of childhood asthma. Additionally, this study’s findings provide another example of the role of genetic background in the causality pathway of childhood asthma and might suggest an autosomal recessive pattern of inheritance. Further research is needed to answer the mode of inheritance and identify specific genes for childhood asthma.

**Background and Research Significance:** The 2005 International Health Regulations (IHRs) define core epidemic prevention, detection, and response capacities countries must build to develop a shared global health security infrastructure. The Joint External Evaluation (JEE) is a WHO reporting tool states use to assess IHR capacities. The JEE is a voluntary process countries are encouraged to complete every five years where national experts score their country’s IHR implementation and validate it with independent international experts. The first JEE functions as a baseline assessment with follow-ups identifying progress and improvement, but JEE revisions in 2018 and 2022 make baseline scores from the First Edition JEE (2016) ostensibly incompatible with newer results. This discrepancy undermines researchers’ ability to analyze national and regional IHR implementation trends.

**Purpose:** This project seeks to understand how indicators were changed across the JEE revisions and develop a method for comparing baseline scores with new Third Edition JEE indicators.

**Methods:** A mapping exercise was conducted to codify continuity between the JEE First, Second, and Third Edition indicators. Appendix 2 of JEE Second Edition was qualitatively coded to describe where First Edition indicators were located in the update. A textual analysis was then conducted between the Second and Third Edition JEEs to identify which indicators’ technical questions from the Second Edition remained in the Third Edition. If at least 50% of a Second Edition indicator’s technical questions were found in a Third Edition indicator, the two were coded as “matching.” Corresponding indicators were consolidated in a simplified “Indicator Changes Map,” which was used in a proof-of-concept comparison of Sierra Leone and Nigeria’s JEE scores from 2017 to 2023.

**Findings and Conclusions:** All indicators across the three JEE Editions were accounted for through the textual analysis. 89.3% of JEE Second Edition technical questions (351) were matched to a Third Edition indicator. The “Indicator Changes Map” successfully identified which 2023 JEE indicator scores should be compared to the 2017 baseline for Sierra Leone and Nigeria, which found average indicator improvement of 0.13 and 0.82 points respectively. These results demonstrate that despite extensive edits to the title, descriptions, and placements of the JEE across revisions, the fundamental IHR core capacities it evaluates remain largely unchanged.

**Implications:** The Indicator Changes Map provides clarity to interpret JEE indicator scores across Editions, allowing researchers to evaluate trends in IHR capacity building at the national, regional, and global levels over time.
Farm Meets Medicine: a scoping review of on-site farm experiences for clinicians-in-training.

Background & Significance of the Study: There is growing recognition of the importance of educating medical providers about nutrition to address health challenges, including food-related chronic disease. But there is less emphasis on educating them about the agricultural systems that grow and produce our food. Yet the interconnection between health and agriculture is undeniable: our food production systems affect environmental health, occupational health, economic well being, nutrition, and lifestyle. To begin to address this knowledge gap, a small number of medical schools and residencies are establishing educational partnerships with farms and community gardens. To date, there is limited research on the design or impact of these novel educational efforts.

The Purpose of Your Research: This scoping review aims to 1) define key concepts and understand the extent to which on-farm learning experiences have been integrated into medical education, 2) assess learning objectives and design of existing programs, 4) analyze types of evidence used to assess such programs, 3) review data collection methods, and 5) evaluate gaps in the knowledge base. By conducting this review, we seek to provide insights that can guide future research and implementation of on-farm education for medical learners.

Methods: We conducted this scoping review using SCOPUS and PubMed databases, identifying articles relevant to collaborations between medical education institutions and agricultural entities. Keywords used included "rural and urban farms," "interdisciplinary farm experience," and "medical education." Interviews will be conducted with relevant researchers and educators to further inform this scoping review.

(Preliminary) Findings & Conclusions: We identified 27 relevant articles that described on-farm learning experiences in medical education. These include primary research, brief reports, and qualitative studies, quantitative studies of 22 separate programs. The educational emphasis of these experiences fell into two categories 1) occupational health and farmworker wellbeing 2) food security, agroecology, and public health. Both offer medical learners valuable opportunities to deepen their understanding of nutrition and the socio-environmental determinants of health. Moreover, these collaborations facilitate engagement between medical learners and community members. While a systematic review of on-farm learning experiences for medical learners has yet to be published, case studies offer important guidance for how to expand these educational efforts.

The Implications of Your Findings and/or Revisiting the Significance of the Research: With increasing emphasis on nutrition, food systems, and structural determinants of health in medical education, novel training partnerships are being forged between healthcare and agriculture. To our knowledge, this is the first attempt to review the published research of these on-farm learning experiences. We anticipate that this scoping review will stimulate further implementation and research of on-farm learning experiences in medical education.
Development of combination DNA vaccines targeting transmission of two major human malaria parasites (*Plasmodium vivax* and *P. falciparum*)

**Background:** Transmission blocking vaccines (TBV) interrupting malaria transmission within mosquitoes represent an ideal public health tool to eliminate malaria at the population level. *Plasmodium falciparum* and *P. vivax* account for more than 90% global malaria burden, and are co-endemic in the regions of Asia, Pacific, Central and South America. P25 and P48/45 are two leading TBV candidates for both species, and have shown promising transmission-blocking activity (TBA) in preclinical and clinical studies. However, neither of individual vaccines can elicit complete transmission inhibition in mosquito. Combination vaccines encompassing multiple antigens have been used for enhancing vaccine efficacy and broadening targeted species. In this study, we have focused on developing the combination TBVs based on P25 and P48/45 against *P. falciparum* and *P. vivax* using advanced DNA vaccine platform.

**Methods:** Female and male mice were immunized with individual DNA vaccines encoding Pvs25, Pfs25, Pvs48/45 and Pfs48/45, as well as various combinations including Pvs25+Pvs48/45, Pfs25+Pfs48/45, Pvs25+Pfs25, and Pvs48/45+Pfs48/45. Antigen-specific antibody responses were assessed via ELISA. Transmission reducing activity (TRA) of antibodies elicited by Pvs25 and Pvs48/45 in individual and combination groups was evaluated using mosquito membrane feeding assays (MFAs) using blood from *P. vivax*-infected donors in Brazil. TRA of antibodies in mice immunized with Pfs25 and Pfs48/45 administered alone or in various combinations was evaluated using in vitro cultured *P. falciparum* gametocytes for MFA.

**Results:** Potent antigen-specific antibody responses were induced in mice immunized with individual DNA vaccines, and specific antibody responses were not compromised when combinations of DNA vaccines were evaluated. The anti-Pvs25 IgG purified from Pvs25 individual and combination groups revealed strong TRA against *P. vivax* in MFAs, exhibiting a dose-response reduction of oocysts in mosquitoes. Similarly, anti-Pfs25 and anti-Pfs48/45 IgGs from mice immunized with Pfs25 and Pfs48/45 DNA vaccines individually and in various combinations resulted in a dose-response transmission reduction of *P. falciparum*.

**Conclusion:** Our studies provide a rationale for combining multiple antigens to simultaneously target transmission of malaria caused by *P. falciparum* and *P. vivax*. 

**Primary Presenter**
Yi Cao

**Co-Presenter(s)**
Clifford T. H. Hayashi

**Status**
Postdoc

**Authors**
Yi Cao
Clifford T. H. Hayashi
Nirbhay Kumar

**Research Mentor/Department Chair**
Nirbhay Kumar
Proposing a quality assessment tool for equity considerations in clinical practice guideline development handbooks

Introduction: Public health organizations publish guideline development handbooks to outline methods they use to create clinical practice guidelines.

Objective: Develop an assessment tool that examines the degree to which equity considerations are included in guideline development handbooks.

Methods: Two literature reviews informed the development of this tool. First, we identified “essential elements,” or tasks experts agree are part of evidence-based guidelines creation. Second, we searched literature to identify best practices for equity consideration in each of these “essential elements.” We then synthesized the findings into an assessment tool format.

We spoke with 30 experts about equity in the guideline development through semi-structured discussions. These experts were men and women from low- middle- and high-income countries who were 1) methodologists 2) guideline developers or 3) PhD students studying a related topic. We updated the tool based on feedback.

Results: We identified 18 essential tasks of guidelines creation from three publications. We visually divided these tasks into 5 domains: planning for the guideline, identifying the guideline group, gathering the evidence, drafting and review, and dissemination, implementation, evaluation and updating the guideline. Each item has six parts: essential element name, definition, criteria for rating, considerations for rating, where to look for the element, and an example quotation.

Experts cited the importance of an auditing tool but cautioned against impractical best practices. They highlighted the importance of panel make-up, including perspectives from stakeholders, and conflict of interest to equity concerns. Experts from low- and middle-income countries noted that adapting/adopting clinical practice guidelines involves distinct processes with unique challenges when compared to de novo guidelines.

Conclusions: Clear guidance for including equity in guideline development may be unrealistic. Instead, this tool proposes organizations assess documents they already have, and foster discussion among developers.
A Cross-Sectional Study of the Association Between Insecticide Treated Bed Net Use and Malaria Prevalence in Sierra Leone

**Background:** The 2016 Sierra Leone Malaria Indicator Survey measured the highest recent prevalence of malaria for any recent DHS survey. With the introduction of new malaria prevention techniques such as vaccines, the utility of previous prevention measures such as insecticide treated net (ITN) distribution and use at the population level has come into question. Evolving insecticide resistance and climate change have potentially reduced the efficacy of ITNs overall. Utilizing this data, we can examine if self-reported bed net use has a protective effect when accounting for other malaria prevention measures taken in the community such as indoor residual spraying (IRS). Demonstrating ITN effectiveness at the population level for reducing malaria infection independent of IRS and other socioeconomic/environmental factors provides evidence for continued mass-distribution of ITNs in the global fight against malaria.

**Purpose:** The use of a countrywide dataset also permits the examination of ITN protection in the context of different socioeconomic and household conditions for improved external validity and reduced selection bias. We hope that demonstrating that ITN use is effective at the population level for reducing malaria infection independent of IRS and other socioeconomic/environmental factors will provide evidence for continued mass-distribution of ITNs in the global fight against malaria.

**Methods:** We devised a cross-sectional study of a representative sample of households in Sierra Leone using 2016 MIS Demographic and Health Survey data. Using a logistic regression model, we aim to compare prevalence odds ratios of *P. falciparum* infection in households as determined by rapid diagnostic test for those who did and did not self-report sleep under an ITN the night before, adjusting for household wealth, location, and construction materials. We also tested for potential effect modification based on previous household IRS in the past year.

**Findings:** We found that ITN use had an OR of 0.82 (p-value = 0.00001) after adjusting for household structure type, household wealth quartile, and urban or rural household location. We found that IRS was not an effect modifier of the relationship between previous night ITN use and malaria infection ($X^2 = 0.887$; p-value = 0.35).

**Conclusions:** Our results suggest that ITN use is effective at the population level for preventing malaria infection. Even with potential improper or irregular use, fading insecticide treatment, and potential physical damage, the protective effect of ITN use was clearly apparent when compared across Sierre Leone and this was not altered by IRS.
Sociodemographic Variables Associated with Food insecurity in Puerto Rico

**Purpose:** Food insecurity (FI) in Puerto Rico (PR) reached as high as 40% after the COVID-19 pandemic. Our purpose was to describe the current FI status and its association with sociodemographic variables and participation in the Nutrition Assistance Program (NAP) which exists instead of SNAP in most US territories.

**Methods:** An online survey was distributed between June-August 2023 to adults living in PR via public school networks. The survey captured sociodemographics and FI (6-item USDA). A poverty variable was created by comparing household annual income to the 2022 USA poverty threshold for their household size. Only participants who responded to all food security questions were included in the analysis (n=681 out of n=993 for total survey). Respondents were considered food insecure if they had low or very low food security. Logistic regression modeled FI dependent on variables that were significantly associated with FI. All analyses were conducted in SPSS V27 and SAS 9.4.

**Results:** The majority of the sample was female (76.5%), ages 25-54 (68%), had completed ≤two years of college (60.6%), were employed (62%) and had an annual household income <$30,000 (65.9%). Nearly 43% of respondents participated in NAP. The majority of the sample (76.5%) was food insecure: 35.2% (n=240) had very low food security and 41.3% (n=281) had low food security. In logistic regressions, FI was associated with NAP (OR 1.40, 95% CI:0.9-2.1  p=0.13 ), Education-Two years of college (OR 1.17,0.68-2.01 p=0.02), Bachelors (OR 0.62 95% CI 0.36-1.05, p=0.08), Masters or Above (OR 0.58 95%CI: 0.30-1.11 p=0.11), poverty (OR 1.46 95% CI:0.95-2.25 p=0.08).

**Conclusion:** Our results show a large proportion of the sample, which is similar in sociodemographics to the general PR population, experienced FI. The rates were higher than previously reported (40%) using similar sampling methods. These findings warrant further study and emphasizes the heightened need to address FI through effective multi-sectoral policies in the archipelago.

**Primary Presenter**
Sabrina Sebastian Lonth

**Status**
Masters

**Authors**
Sabrina Sebastian Lonth
Natalia Guerra Uccelli
Cesar Ostolaza
Carla Rosas
Lisa Poirier
Crystal Díaz
Oscar Meléndez Colón
Ana Maria García Blanco
Francisco Tirado
Joel Gittelsohn
Uriyoán Colón-Ramos

**Research Mentor/Department Chair**
Uriyoán Colón-Ramos
Geospatial disparities in federal COVID-19 test-to-treat program

Background & Significance of the Study
Paxlovid is authorized for the treatment of COVID-19 and must be used within the first 5 days of symptom onset to be effective. This limited window for initiating treatment makes rapid access critical. Federal Test-to-Treat programs provide tests, prescriptions, and medication in one visit.

The Purpose of the Research
The purpose of our study was to map the location of Test-to-Treat programs in the United States and identify disparities in access.

Methods
We obtained location data for public providers of Paxlovid and Test-to-Treat programs in the contiguous U.S. and examined their spatial distribution at the zip code tabulation area (ZCTA) level. We defined ZCTAs as underserved if there was no Test-to-Treat program located within the ZCTA or within 20 miles of its boundaries. We then used data from the US Census Bureau (poverty and race/ethnicity information) and USDA (urbanicity information) to examine trends in the characteristics of underserved ZCTAs.

Findings
More than 52,000,000 people—representing 16% of the continental U.S. population—do not have access to a Test-to-Treat program in their zip code or within 20 miles. The majority of zip codes representing metropolitan areas have a Test-to-Treat program within 20 miles (77%). In contrast, only 30% of small towns and 23% of rural areas have nearby access. Zip codes with a high proportion of Hispanic and Black residents were likely to have access to nearby Test-to-Treat programs (72%, 70%). In contrast, the majority of zip codes with a high proportion of American Indian/Alaska Native residents were underserved (70%). About half of high-poverty zip codes do not have access to a Test-to-Treat program within 20 miles.

Implications
Disparities in outcomes related to COVID-19 have been apparent since the beginning of the pandemic and continue to grow. While the multi-dimensional measure of social vulnerability was used to expand the federal Test-to-Treat program, some populations remain without access.
Qualitative Analysis of Perceptions of Healthy Menu Options of Latinx Restaurant Owners in Washington, D.C.

**Background:** Targeting Hispanic/Latinx independently-owned restaurants can shape the dietary behaviors of the surrounding community, which tend to include populations that are of similar ethnicities and are disproportionately at risk of experiencing health inequities. Yet, few public health nutrition interventions have partnered with independently owned restaurants, in large part because researchers do not understand, from the restaurant owner’s perspective, what it would take to promote healthy menu options in their restaurants.

**Purpose:** To understand the perspectives of Latinx restaurant owners on the promotion of healthy menu options in Washington, D.C.

**Methods:** Fourteen in-depth interviews of Latinx restaurant owners were conducted in Spanish (n=12) and English (n=2) and transcribed verbatim in the fall 2023. The author analyzed qualitative data using an inductive approach. Codebook and thematic findings were revised by the faculty advisor and an independent coder to maximize rigor.

**Results:** Eight themes emerged from the data. (1) Latino Identity and Diet: Latino restaurant owners often perceived their identity as integral to their culinary offerings, rooted in traditional staples like rice, beans, and tortillas. This connection to their cultural heritage shaped both their menu choices and their customers' preferences. (2) Perceptions of Healthy Eating: Owners expressed concerns about health, acknowledging the need for balance while also catering to varied tastes. Their insights shed light on the complex interplay between personal health consciousness and customer demand. (3) Economic Considerations: Owners are strategically shifting their menu offerings away from fresh or healthier options, either to enhance profitability or to gain a competitive advantage by catering to evolving consumer preferences. (4) Preparation Styles: Owners employed various preparation styles in their culinary practices, influenced by tradition, customer preferences, and health considerations. (5) Menu development and adaptation: These dynamic processes were shaped by customer preferences, seasonal availability of ingredients, and economic considerations. (6) Promotion of Healthy Menu Items: Some owners expressed the need to balance their desire to offer nutritious options with the need to attract and retain customers. (7) Procurement Considerations: Seasonal variability in ingredient availability posed challenges for owners, who adapted their menus and sourcing practices to ensure the freshness and quality of their dishes. By leveraging seasonal ingredients and fostering relationships with suppliers, owners enhanced the culinary experience for their customers. (8) Customer Preferences: Owners prioritized customer satisfaction by offering dietary accommodations and personalized experiences tailored to individual preferences (i.e. reducing salt and sugar, using different oil types, or altering cooking methods).

**Conclusions:** These findings provide key insights into the complex dynamics involved in offering healthier food choices in independently owned Latino restaurants in DC. These insights are critical for public health nutrition interventions that aim to improve healthy eating in independently owned restaurants.
Exploring Factors Associated with Vaginal Doucheing Practices among Female Sex Workers: Implications for HIV Prevention

**Background:** Douching persists among female sex workers (FSWs) despite health risks. This study explores the reasons behind this practice, including cultural beliefs and misconceptions about HIV prevention. This study explores the link between douching and HIV in FSWs and considers a microbicide douche as a potential prevention method. Frameworks analyzing both individual and societal factors are crucial for developing effective interventions to promote safer sex practices among FSWs.

**Methods:** A scoping review will explore the limited literature on douching practices among female sex workers (FSWs) and its connection to HIV prevention. It aims to map existing knowledge, identify research gaps, and include diverse evidence sources. The review will focus on how cultural, social, and behavioral factors influence douching practices and its implication for HIV transmission risk among FSWs.

**Results:** Of the 925 papers identified in the search, 25 papers were extracted to conduct a thematic synthesis on the factors and reasons identified behind douching, primarily documenting the sex worker populations in Africa and East Asia regions. Results indicated that the main reasons for douching included personal behavior and beliefs and societal stigma and perspective due to nature of work. There was no direct linkage between douching practices increasing HIV transmission, but the review indicates a much higher risk to STDs and HIV acquisition due to change in the vaginal microbiome.

**Conclusion:** This study indicates that more research needs to be conducted to identify if there is direct connection between douching and HIV. This study also can help support research and development of a vaginal microbicide douche which will provide this population with a HIV prevention method that is conducive to current practices and habits.
Health system intervention packages on improving coverage of kangaroo mother care for preterm or LBW infants: a mixed-methods systematic review

Introduction. Global coverage of Kangaroo mother care (KMC) remains low and health system intervention strategies that may improve coverage are not known.

Methods. We conducted a systematic review of studies evaluating the effect of health system intervention strategies for KMC implementation compared to no or different interventions, on KMC coverage in preterm or LBW infants. KMC coverage achieved by various studies was summarized. All included studies were classified as those that achieved increased KMC coverage (defined as ≥25% increase from baseline, with final coverage ≥50%) or low KMC coverage (defined as <25% increase from baseline or final coverage <50%). Studies that achieved increased KMC coverage were further classified based on the mean duration of skin-to-skin contact (SSC; hours per day) achieved. Health system interventions in different categories were summarized by WHO health system building blocks to understand factors linked to increased KMC coverage.

Findings. We identified 16 studies evaluating 15 health system intervention packages for KMC implementation that applied interventions in one or more health system building blocks that reported KMC coverage. All three studies that applied interventions across 5-6 building blocks (100%), two of the four studies that applied interventions across 3-4 building blocks (50%), and three of the nine studies that applied interventions across 1-2 building blocks (33%), achieved increased KMC coverage. Studies that did not achieve increased coverage had interventions primarily targeting health workforce and service delivery and were weak on leadership and governance, financing, and health information systems. All three studies that achieved increased KMC coverage with mean SSC ≥8h/d (100%), three of the five studies that achieved increased KMC coverage with mean SSC <8h/d (60%), and three of the eight studies with low KMC coverage (38%) had high-intensity interventions in at least one health system building blocks. High-level leadership engagement, KMC supportive policies, staff licensing, and facility standards regulations, strengthened numbers and capacity of nursing staff, government funding and expanded health insurance, wards with conducive environment, and recording KMC-specific indicators in clinical registers were key factors among studies that achieved increased KMC coverage.

Conclusion. High-intensity interventions across multiple health system building blocks should be used for equitable scale-up of KMC.
GWSPH RESEARCH SHOWCASE
GLOBAL HEALTH

Effects of rIL2/anti-IL2 antibody complex on chikungunya virus-induced chronic arthritis in a mouse model

Background: Chikungunya virus (CHIKV) is characterized by disabling joint pain that can cause persistent arthritis in approximately one-fourth of patients. Currently, no standard treatments are available for chronic CHIKV arthritis. Our preliminary data suggest that decreases in interleukin-2 (IL2) levels and regulatory T cell (Treg) function may play a role in CHIKV arthritis pathogenesis. Low-dose IL2-based therapies for autoimmune diseases have been shown to up-regulate Tregs, and complexing IL2 with anti-IL2 antibodies can prolong the half-life of IL2.

Methods: A mouse model for post-CHIKV arthritis was used to test the effects of recombinant IL2 (rIL2), an anti-IL2 monoclonal antibody (mAb), and the complex on tarsal joint inflammation, peripheral IL2 levels, Tregs, CD4 + effector T cells (Teff), and histological disease scoring.

Results: The complex treatment resulted in the highest levels of IL2 and Tregs, but also increased Teffs, and therefore did not significantly reduce inflammation or disease scores. However, the antibody group, which had moderately increased levels of IL2 and activated Tregs, resulted in a decreased average disease score.

Conclusion: These results suggest the rIL2/anti-IL2 complex stimulates both Tregs and Teffs in post-CHIKV arthritis, while the anti-IL2 mAb increases IL2 availability enough to shift the immune environment towards a tolerogenic one.

Implications: The rIL2/anti-IL2 complex increased IL2 levels over what was necessary for Treg expansion and activation. As a result, excess IL2 also impacted Teff cell proliferation alongside that of Tregs. Future studies will evaluate the use of a novel IL2 fusion protein linking IL2 and mouse IL-2Rα (CD25) in the post-CHIKV arthritis mouse model. This fusion protein is the most promising version for future therapeutic delivery of low-dose IL-2 therapies. Its increased stability compared to that of the rIL2/antiIL2 complex will help to control the off-target effects seen by the complex. Thus, we hypothesize the fusion protein will have a greater effect on post-CHIKV arthritis.

Primary Presenter
Sarah Tritsch

Co-Presenter(s)

Status
Doctoral

Authors
Abigail J. Porzucek
Arnold M. Schwartz
Abigale M. Proctor
Richard L. Amdur
Patricia S. Latham
Gary L. Simon
Christopher N. Mores
Aileen Y. Chang

Research Mentor/Department Chair
Christopher N. Mores
Antenatal corticosteroids to pregnant women at risk of preterm labor in low- and middle-income countries: utilization and facility readiness

Background
Antenatal corticosteroids (ACS) use among pregnant women at risk of preterm labor can accelerate fetal lung maturity, reducing respiratory complications and neonatal death. ACS adoption in low- and middle-income countries (LMICs) remains disproportionately low, despite LMICs contributing to 80% of preterm births globally. However, administering ACS in inadequately equipped settings could be harmful to mothers and newborns. The structural readiness of facilities globally to provide ACS is unclear.

Objective
We used health facility survey data from nine LMICs to assess ACS utilization and facility readiness to administer ACS based on the 2022 WHO recommendation on ACS use.

Methods
The study used Service Provision Assessment (SPA) national survey data in nine LMICs. The primary outcome was the proportion of facilities that reported ever providing ACS. We also assessed corticosteroid availability and facility readiness to administer ACS. Based on the criteria in the 2022 WHO recommendations, a total of 35 indicators were grouped into four categories to assess readiness. Readiness indexes were calculated for each criterion; an overall readiness index by averaging the readiness indexes for each criterion was also reported. Indexes were presented in percentage with higher percentages indicating better readiness. Results were stratified by facility level according to whether facilities provided only antenatal care (level 1), normal deliveries (level 2), or Cesarean sections (level 3).

Results
Across nine countries, only 12.9% (median, range 6.7% - 68.7%) of facilities had provided ACS, while none of the level 1 facilities had provided ACS. Only one-third (median 34.5%, range 4.6% - 93.3%) of facilities had corticosteroids available at the time of survey. The utilization and availability of corticosteroids were positively correlated and increased by facility level. Across the four categories, the readiness index was the lowest for criterion 1 (ability to assess GA accurately and identify women at risk) (10.0%), followed by criterion 2 (ability to identify maternal infections) (26.5%), criterion 3 (ability to provide adequate childbirth care) (32.6%), and criterion 4 (ability to provide adequate preterm newborn care) (37.3%).

Conclusion
We proposed a strategy for measuring facility readiness for implementing one of the most effective interventions to improve neonatal survival. Generally, health facilities in these nine countries had low readiness, with 20% of them scoring above 50% on the overall readiness index. The tradeoff between the life-saving benefits of using ACS and the feasibility of achieving facility structural readiness should be evaluated and considered within the specific context of each country.
Health Policy and Management
Using Machine Learning Tools to Bring Underserved Communities' Data to Life: Evidence from a Hospital System

**Background & Objectives:** Standardized medical diagnoses such as ICD-10 codes are essential for researchers to examine population level health outcomes. However, disadvantaged groups are more likely to frequent hospitals and other care establishments that do not perform diagnosis coding (or do it very inaccurately) and therefore we have limited evidence regarding the health needs of disadvantaged groups. Using data of 620,000 visits to the Emergency Department of a high-volume hospital in Karachi, Pakistan providing free-of-cost care, we demonstrate how recent advances in Natural Language Processing (NLP) make it possible to recover this information from unstructured triage notes, physician notes, diagnoses, and other recorded information leading to a better understanding of local area epidemiology.

**Methods:** Our method uses a Random Forest model with a multi-label multi-class approach to assigning ICD-10 codes from clinical notes. We generate text features from medical notes coming at different stage of the workflow, from intake to diagnosis to discharge. We also include additional features created from the Hospital MIS (HMIS) system such as demographics (age, gender), patient vitals (BP, Temperature, etc.), acuity level determined by the triage nurse, as well as aggregated temporal features based on all the above information. Our model generates, for each patient visit, a ranked list of suggested ICD-10 categories. Our main metrics are 1) Precision at “k”: of the top “k” ICD-10 categories returned for each visit and diagnosis, what percent of the predicted categories are correct, averaged over patient visits? 2) Recall at “k”: of the top “k” ICD-10 categories returned for each visit and diagnosis, what percent of the true categories are correctly predicted, averaged over patient visits?

**Results:** Our best model captures on average 82% of all ICD-10 categories for a visit when looking at up to 5 (k=5) recommended codes (precision) and correctly recovers 73% of all ICD-10 categories (recall). We further validate the model by generating a sample list of 1,000 randomly selected visits from January 2021 to March 2021, with each visit having the top 10 recommendations of categories made by the model trained (k=10). Of all patients-visit on the set, 75% got at least 1 category recommendation correct. Most of the patients have 2 or 3 codes in the same visit and best performance happens in patients that have 3 different codes in the top 10 recommendations with 50% accuracy.

**Conclusion:** In conclusion, novel machine learning methods using NLP are integral in ascertaining health outcomes of populations that are underserved by well-functioning hospitals. Previously unused data such as physician notes that are only used in isolation to treat a single patient can be aggregated to build meaningful population-level epidemiological understanding.

Primary Presenter
Ahwaz Akhtar

Co-Presenter(s)

Status
Doctoral

Authors

Research Mentor/Department Chair
Avi Dor
Obesity Measurement Techniques and Future Directions for the Diagnosis of Obesity

Background: Obesity is a complex, chronic disease that impacts more than 40% of adults in the United States. Many obesity care providers and patient advocates believe that Body Mass Index (BMI), the most common obesity screening tool, oversimplifies a diagnosis of obesity and does not provide a comprehensive understanding of a patient’s health. There is no one measure that is recommended across health organizations that accurately diagnoses obesity.

Purpose: To understand what current expert organizations recommend as appropriate obesity diagnosis tools and review the identified tools in terms of their effectiveness and ease of use in healthcare settings to diagnose obesity. This research also aims to identify gaps and weaknesses in current protocols to measure and diagnose obesity.

Methods: Clinical practice guidelines from several obesity care organizations were reviewed for common methods of measuring body fat for obesity diagnosis. The subsequent literature review was conducted using the Himmelfarb Library database and a combination of the words obesity, screening, diagnosis, and the measurement strategy in order to examine the efficacy and ease of use of the identified tools. Body measurements included BMI, waist circumference, and waist-to-hip ratio.

Preliminary Findings: Body mass index and waist circumference are the most common body fat measures used to diagnose obesity. These measures aim to quantify the amount of body fat on a person. Waist circumference is a surrogate for visceral fat, which is known to be associated with more health complications. Several critiques of the BMI measure include its inability to determine body fat distribution on a patient and the percent of a patient’s weight that is body fat. Waist circumference is easy to measure and is strongly correlated with body fat percentage. It predicts the development of comorbidities associated with obesity. The waist-to-hip ratio has similar benefits but increases the likelihood of measurement error because of the difficulty of measuring hip circumference. It also is more difficult to interpret than BMI or waist circumference.

Implications of Findings: A distinction needs to be made between screening and diagnosing obesity. There is a gap in the literature for a set criteria for diagnosing obesity as a chronic disease. Currently, the NIH defines obesity as a BMI over 30 and does not mention the existence of comorbidities essential for a diagnosis. Further research into the feasibility of assessment techniques such as the Edmonton Obesity Staging System or obesity class system should establish why more measures other than body fat are needed for diagnosis of obesity. Currently, there are no healthcare quality measures linked to payment used to analyze if and how providers are diagnosing obesity, which is an important part of incentivizing obesity diagnosis. Experts should determine an appropriate standard of care beyond body fat for diagnosing obesity, and identify the measures that directly capture the effects of body fat excess on health.
Latent class analysis of cannabis use characteristics and associations with hazardous use outcomes, quitting related factors, and mental health among a sample of US young adults

To properly represent differences in cannabis use characteristics such as use frequency, types of products, and modes of use, this study conducted a latent class analysis (LCA) among 4,031 young adults aged 18-34 reporting past-month usage in 2023. Resulting classes analyzed for associations with hazardous use outcomes, quitting-related factors, and mental health.

LCA classes included 1) infrequent (M=4.52 days [past-month], mainly bud (39.9%) and edibles (40.4%); 2) frequent (M=29.22 days), mainly bud (74.5%); 3) moderate bud (M=18.73 days), primarily bud (96.2%); and 4) moderate oil/other product (M=15.75 days), primarily oils (75.5%) or other forms (14.1%). Compared to the infrequent class, classes 2-4 were more likely Black, parents, and less educated. Frequent and moderate classes were older and more likely male and cohabitating. Frequent was less likely employed part-time or students and single. Compared to moderate bud users, frequent was less educated and more likely to be employed part-time and suburban. Moderate oil/other were more educated and less likely unemployed, and single. Compared to frequent bud users, moderate oil/other was younger and more likely straight, Asian, college-educated, employed part-time or students and single.

Compared to moderate bud as the referent, moderate oil/other class reported the importance of quitting as higher, lower confidence to quit, more mental health symptoms, and higher hazardous use indicators. They were also more likely to drive after cannabis and alcohol use than the frequent bud class. Compared to moderate bud, frequent users reported lower confidence to quit, fewer hazardous indicators, and more likely to drive after cannabis and alcohol use. Infrequent users reported higher confidence to quit, fewer mental health symptoms, and were less likely to drive after cannabis and alcohol use.

Frequent and moderate cannabis use, particularly of oils and concentrates, may increase risk for mental health symptoms and hazardous use, and reduce confidence to quit. Thus, addressing and preventing such use patterns is crucial.
“The next closest step to having control over my own body”: Adolescent and Young Adult Contraceptive Decision-Making Post-Dobbs

Background & Significance
Dobbs has the potential to disproportionately impact adolescents and young adults (AYA). AYA face access barriers to confidential contraceptive services that adults do not. The Dobbs decision has the potential to significantly exacerbate these access challenges. At the same time, high-impact events also can shift immediate contraceptive method preferences.

Purpose
This study seeks to understand changes in AYA contraceptive decision-making post-Dobbs by analyzing population-level shifts in method type alongside AYA perspectives on changes to abortion accessibility after Dobbs.

Methods
This study used a concurrent mixed-methods design, combining thematic analysis of qualitative survey data and quantitative analysis of medical claims data from IQVIA. Qualitative data for this study came from two waves of the MyVoice project, an SMS-based weekly survey of a population-based sample of young people in the United States. For each MyVoice survey wave (summer 2022 and summer 2023), the research team analyzed all responses thematically to identify key themes. The quantitative data source for this study was IQVIA prescription and medical claims. Using National Drug Codes, we identified new prescriptions for the contraceptive pill, patch, and ring by month from 2021 and 2022. Using Current Procedural Terminology codes, we identified visits for IUD insertion, implant placement, and DMPA/injectable provision during the same time period. For each service, we calculated rolling three-month averages by age group, 15-18, 19-26 and 27-44.

Findings & Conclusion
AYA respondents described feelings of urgency and fear as well as concerns over barriers to access in states with restrictions post-Dobbs, feelings that appear to have translated to slight increases in average contraceptive prescriptions and visits in July 2022. Over the full time period examined, prescriptions and visits for patients 19-26 and 27-44 continued their pre-Dobbs pattern of decline while those for patients 15-18 held steady.

Implications
AYA feelings and perspectives on this issue are important and valuable, even if they do not translate into prescriptions and visits. Expressions of urgency, feelings of lost agency, and concerns over access not translating into prescriptions and visits in the longer term may reflect continued (or worsened) barriers to contraceptive and reproductive healthcare access for AYA post-Dobbs. In light of our results, it is critical for policymakers to act to ameliorate barriers to access for AYA seeking reproductive healthcare.
The Association of Telehealth Utilization and Insurance Coverage in 2022

Background: The benefits of telehealth services became apparent amidst the pandemic, leading the government to extend and uphold pertinent policies, mainly targeting rural and behavioral health sectors. Telehealth is poised to become a pillar within the healthcare system, and the provision of such services will be further expanded and diversified. Despite a spotlight from the government and other parties, disparities in access to this new form of care persist. This study explored whether demographic, socioeconomic, function, and health factors influencing telehealth service utilization differ across insurance types.

Methods: Using the 2022 National Health Interview Survey Sample Adult Interview, the sample population covered 27,651 adults aged 18 years and older. The outcome variable was whether the respondent used telehealth services or not. The independent variables were categorized to four sections: demographic, socioeconomic, function, and health. Bivariate and weighted multivariate logistic regression were conducted to observe odds ratios (OR) and 95% confidence intervals (CI).

Results: The likelihood of using telehealth services was 2.91 times higher in private health insurance enrollees and 3.60 times higher in public health insurance enrollees compared to the uninsured. The experience of prescription medication for mental health was the most influencing factor for the insured population – private (OR 3.30; 95% CI 2.28-4.79) and public (OR 2.61; 95% CI 1.47-4.63). The number of emergency visits was the most influencing factor for the uninsured. Those who visited the emergency more than four times compared to those without visits were 7.9 times more likely to use telehealth services.

Conclusion: This study observed different factors and barriers to telehealth services use across different insurance types. The uninsured individuals were less likely to use the services than those with any type of insurance. Those who frequently visited hospital emergency had higher likelihood of using telehealth services among the uninsured. Further research is necessary to develop tailored telehealth policy.
De-Beefing the U.S. Agrifood System: A Qualitative System Dynamics Approach

Background & Significance
Human and planetary health are inextricably linked through the food we produce, process, distribute, consume, and ultimately waste. Current dietary patterns, particularly in the U.S., are unsustainable with high rates of beef consumption contributing disproportionately to the adverse impacts of our agrifood system on the climate crisis and diet-related chronic diseases. As a top producer and consumer of beef globally, the U.S. has a compelling opportunity to actively tackle the climate crisis.

Purpose
Limited action toward reducing beef consumption, or ‘de-beefing,’ suggests that despite evidence indicating the co-benefits of a shift away from beef, the competing interests of agrifood system actors and their power imbalances contribute to a state of policy inertia surrounding beef in the U.S. ‘De-beefing’ reflects a reasonable and actionable solution to the often-polarizing debates around meat, calling for a reduction in beef consumption to alleviate the significant burden on human and planetary health without demanding its complete elimination.

Methods
The complex structure of the beef system and its many interested actors indicate the need for a systems approach to inform decision-making. Thus, the goal of this research was to employ qualitative system dynamics to identify dynamic structures driving policy resistance to de-beefing the U.S. and identify strategic points to intervene in the system that can contribute to a desirable change.

Findings & Implications
The causal loop diagrams presented in our paper elucidate three key drivers of current unsustainable trends in beef consumption in the U.S. including (1) widespread availability and accessibility of beef relative to alternatives, (2) powerful industry influence, and (3) strong social norms and information asymmetry. These drivers individually and collectively act as barriers to change. Researchers and policymakers should prioritize actions across these three drivers to both increase access and exposure to healthy and sustainable alternatives to beef and increase consumer and policymaker awareness of the human and environmental impacts of beef. A strength of this research is its explicit recognition of the political nature of food and the power imbalances between governments, industry, and consumers. The qualitative insights presented here reflect a context-specific, focused analysis of beef consumption in the U.S. using existing literature and data sources with implications for stakeholders across the U.S. agrifood system, particularly researchers, policymakers, advocates, and consumers.
Estimating the Workforce Prescribing Contraception in the US: Evidence from a National Claims Dataset

**Background:** Contraception care is an essential preventive health service. Previous research has examined the supply, distribution, and adequacy of the health workforce providing contraception services, but this research has faced a series of data limitations, relying on surveys or a subset of practitioners, resulting in an incomplete picture of contraception providers in the United States. This study leverages a unique dataset to examine the workforce prescribing contraception.

**Purpose:** To understand the distribution of the workforce prescribing the contraceptive pill, patch, and/or ring by geography and specialty.

**Methods:** We compiled a national dataset using multiple data sources: 2022 IQVIA pre-adjudicated prescription claims, which contain 94% of all retail prescription claims in the US, and American Community Survey data on county population. We calculated the number, percentage, and density if providers within each specialty that provided these services by state and county.

**Findings & Conclusions:** Nearly 700,000 women of reproductive age (15-44) live in a county with at most 5 contraception prescribers. 55% of counties had more advanced practice clinicians (APRNs and PAs) prescribing contraception than physicians (OBGYN, family medicine, internal medicine, and pediatrics). The density of contraception prescribers ranged from 26.5 per 10,000 reproductive age women in New Jersey to 73.9 in Maine. There was also substantial county variation within states; while Louisiana ranked in the top 20% of states for OBGYNs prescribing contraception per population, over half of counties in the state had no OBGYNs prescribing.

**Implications:** Many individuals in the United States face substantial challenges in obtaining contraception services, and disparities exist across rural/urban areas, insurance type, and race/ethnicity groups. While often measured in terms of the supply of women's health specialists, the reproductive health workforce includes primary care and advanced practice clinicians. These clinicians may ensure access for underserved communities. Investment in training as well as removing or reducing scope of practice barriers for advanced practice clinicians could increase both the number and types of providers who can offer these services.

**Primary Presenter**
Ellen Schenk, MPP

**Status**
Research Staff

**Authors**
Ellen Schenk, MPP
Julia Strasser, DrPH, MPH
Qian Luo, PhD
Mandar Bodas, PhD
Candice Chen, MD, MPH

**Research Mentor/Department Chair**
Anne Markus, PhD, MHS, JD
Prevention and Community Health
Birth Weight as a Risk Factor for Type 2 Diabetes and Gestational Diabetes Mellitus Among South Asian Women Living in the US.

Background: There is a lack of research concerning the relationship between birth weight and type 2 diabetes mellitus (T2DM) and/or gestational diabetes mellitus (GDM) among South Asian (SA) women in the United States (US). This study investigates if such an association exists between birth weight and the development of T2DM and GDM among SA American women aged 18 or older residing in the US. The overarching research question guiding this study is the following: Among South Asian women living in the US, what is the relationship between a woman being born with a very low birth weight (VLBW) or low birth weight (LBW) herself and having a later diagnosis of type 2 diabetes mellitus (T2DM) and/or gestational diabetes mellitus (GDM)? Understanding this association is necessary for early identification and targeted intervention strategies to mitigate the risk of diabetes within this population, one of the fastest growing populations in the US.

Methods: To explore the relationship between birth weight and diabetes risk among SA American women, a quantitative web-based cross-sectional anonymous survey was developed and distributed to recruit a diverse sample of qualifying participants (N=2634). The survey assessed multiple domains including very low birth weight (VLBW), low birth weight (LBW), pregnancy history, and T2DM and GDM diagnoses.

Results: Of the study population, 21.9% were born VLBW (<1500g), 30.8% were born LBW (<2500g), 12.4% had T2DM, and 25.9% had a GDM diagnosis. Upon statistical analysis and after controlling for covariates, women who were born with a VLBW have 6.538 higher odds (p-value: <.001) of developing T2DM than women who were not born VLBW. Additionally, women who were born with a LBW have 4.251 higher odds (p-value: <.001) of developing T2DM compared to women who are not born LBW. SA American women who were born LBW and VLBW have 2.500 and 2.588 higher odds of developing GDM, respectively, compared to participants not born with GDM (p-value <.001).

Conclusion: The findings of this study underscore a compelling association between SA American women being born VLBW or LBW and the heightened risk of developing T2DM and GDM. By identifying birth weight as a potential early indicator of predisposing diabetes, these findings can contribute to evidenced-based interventions tailored to South Asian American women born VLBW or LBW with the aim of reducing the prevalence of diabetes and improving long-term health outcomes.
Timing of physical activity is associated with BMI and total weekly MVPA in young adults: a cross-sectional analysis

**Background:** Limited evidence to-date suggests that the timing of daily physical activity is associated with weight, cardiometabolic health, and total moderate-to-vigorous physical activity (MVPA) in adults. However, few studies have tested associations among young adults, who are biologically and behaviorally different from adult counterparts.

**Methods:** Young adults (N=459, 18-35 years) enrolled in a weight management program provided data on BMI, cardiometabolic risk (an index measuring clinically elevated abdominal circumference, systolic and diastolic blood pressure, HbA1c, and HDL cholesterol), and 4-7 days of ActiGraph accelerometer (wGT3X-BT) wear time at baseline. Descriptive statistics (mean±SD) were generated. Activity time-of day was operationalized as quartiles of the temporal distribution of MVPA minutes per hour in the sample at baseline: morning (06:00-11:59), afternoon (12:00-15:59), evening (16:00-18:59), and night (19:00-00:59). The proportion (%) of total weekly MVPA minutes occurring in each time category was used to predict BMI (primary outcome) and total weekly MVPA using linear regression models, as well as to predict the probability of elevated cardiometabolic risk using quasibinomial logistic regression models. Models were adjusted for age, sex, race/ethnicity, housing status, total weekly MVPA (BMI and cardiometabolic risk models only), and caloric intake (BMI models only). Subgroup contrasts were performed for sex and age categories.

**Results:** The analytic sample (n=408, Age=23.8±4.5, BMI=31.1±4.4) was 79% female and 49% non-Hispanic White, with a mean weekly MVPA of 311±167 minutes. Women recorded a greater proportion of their weekly MVPA during the morning, compared with men (29±16% vs. 25±13%, p=0.043), while men recorded a greater proportion of their weekly MVPA during the night than did women (23±13% vs. 20±13%, p=0.035). In adjusted models, MVPA timing was associated with BMI and total weekly MVPA, but not cardiometabolic risk, independent of total weekly MVPA minutes. Specifically, in 26-35-year-olds, morning MVPA was positively associated with total weekly MVPA (2.49 [0.65, 4.33] min), afternoon MVPA was inversely associated with total weekly MVPA (-3.41 [-5.50, -1.32] min), and evening MVPA was inversely associated with BMI (-0.06 [-0.12, -0.01] kg/m²). No significant associations were found among 18-25-year-olds.

**Conclusions:** MVPA timing was associated with BMI and total weekly MVPA in 26-35-year-old young adults. For example, for the average 26-35-year-old participant, accruing an additional 20% of weekly MVPA in the evening (i.e., an extra 9-minutes per day) would equate to a clinically relevant 1.2 kg/m² lower BMI. Interventions designed to benefit weight and/or behavioral health in young adults may be optimized by providing age-tailored, time-based activity recommendations.
Prevalence of Burnout Among the Maternal and Child Health Workforce

**Background:** The Maternal and Child Health (MCH) workforce, including MCH professionals working in public health, healthcare, community-based, governmental, or other organizations, faces three concurrent crises that pose a risk for burnout: 1) rising maternal mortality/morbidity rates, 2) the aftermath of COVID-19, and 3) the *Dobbs* decision. The MCH workforce also demonstrates risk factors for burnout, such as exposure to long hours, sensitive topics, heavy workloads, gender discrimination, and lack of workplace autonomy. Despite these indications that the MCH workforce is experiencing higher rates of burnout, studies have yet to investigate this topic. To fill this gap in the literature and build toward a more resilient workforce, this study aims to understand the prevalence of burnout and subjective well-being, determine which dimensions of burnout are most prevalent, and explore the relationship between sociodemographic characteristics and burnout and subjective well-being among the MCH workforce.

**Methods:** A cross-sectional study conducted from February 14 to March 5, 2024, surveyed professionals in the MCH field in the United States aged 18 or older using a web-based, anonymous survey. Data collection utilized the QualtricsXM platform, with survey links shared through various professional networks, online groups, and organizations related to MCH, resulting in a final sample of 313 respondents. The survey included validated instruments such as the Maslach Burnout Inventory - Human Services Survey (MBI-HSS) and the short scale of the Oxford Happiness Questionnaire (OHQ) to measure burnout and subjective well-being, respectively.

**Results:** Initial findings indicate that within the spectrum of burnout dimensions, the MCH workforce exhibited the highest levels on the emotional exhaustion subscale while registering comparatively lower scores on the depersonalization subscale. Furthermore, assessments derived from the personal accomplishment subscale and the OHQ suggest a moderate sense of professional fulfillment and overall life satisfaction among MCH professionals. Notably, disparities in scores on the MBI-HSS and OHQ were observed across various demographic variables, including age, gender, occupation, professional experience, and educational attainment.

**Conclusion:** These findings shed light on the nuanced dynamics of burnout and subjective well-being within the MCH workforce, emphasizing the importance of addressing these issues amidst ongoing challenges. As organizations and policymakers strive to cultivate resilience and support among MCH professionals, understanding the interplay between sociodemographic factors and burnout can inform targeted interventions to foster a healthier and more sustainable work environment within this critical public health sector.
Young adult cancer survivor perspectives on cancer’s impact across life domains

Purpose. Young adult cancer survivors experience disruptions in various life domains (e.g., relationships, academic/career) during and after treatment. This study examined life disruptions and related supports to inform interventions to improve psychological outcomes.

Methods. In April-July 2023, young adult survivors (n=23) were recruited (via clinics, support groups, non-profit organizations, etc.) to complete semi-structured interviews assessing cancer’s impact across life domains, how they coped with related disruptions, and facilitators to improved psychosocial well-being. We used a dual deductive-inductive approach to develop a codebook, then coded transcripts in Dedoose.

Results. This sample was on average 33.7 years-old (SD=4.4), 78.3% female, 73.9% non-Hispanic White, 47.8% married/cohabitating, 2.4 (SD=1.0) years post-diagnosis, 1.4 years (SD=0.9) post-treatment, and largely diagnosed with breast cancer (52.1%) or leukemia/lymphoma (34.7%). The most salient themes related to disruptions included mental health, feelings of isolation during survivorship, and disruptions to career and relationships with family or partners. Participants reported challenges navigating these feelings and disruptions, and difficulty understanding and conveying their needs. Many experienced limited support for navigating cancer-related trauma and life disruptions as a survivor. Participants also reported some positive impacts, like reevaluating their values and goals or feeling resilient, and emphasized the need to identify supports, accept that life had changed due to cancer, and have their needs and continued struggles validated by others during survivorship.

Conclusions. Young adults experience ongoing disruptions across multiple life domains, underscoring the need for comprehensive, integrated healthcare approaches with accessible, longer-term psychosocial supports to help them navigate these disruptions and reevaluate their goals.
Household Food Insecurity Trajectories and Mental Health Outcomes of Adolescent Girls and Young Women in rural South Africa

**Background:** South Africa has a high burden of both household food insecurity (HFI) and poor mental health, particularly in adolescent girls and young women (AGYW). Despite their high documented prevalence, the relationship between HFI and mental health of AGYW in South Africa remains understudied, with existing studies limited by their cross-sectional designs. A clearer insight into this relationship is needed to inform the design of interventions that can promote mental health of South African adolescents.

**Objective:** This longitudinal study aimed to identify the association of HFI trajectories with anxiety, depressive symptoms, and hope in AGYW in rural South Africa.

**Methods:** We used secondary data from the HIV Prevention Trials Network (HPTN) -068, a phase III randomized control trial, conducted in Agincourt. We used complete data from 1779 AGYW collected at baseline (2011/12) and three annual follow-up visits. HFI trajectories, measured using the Household Hunger Scale, were estimated using data from the first three waves via Group-Based Trajectory Modelling. We used data from AGYW’s last two follow-up visits to analyze self-reported incident anxiety and depressive symptoms and hope. We specified logistic, modified Poisson, and log-binomial regression models to estimate the association between HFI trajectories and anxiety symptoms, depressive symptoms, and hope, respectively. Models were adjusted for sociodemographic variables, diet, household negative shocks, and study arm in the original trial.

**Results:** Moderate-severe hunger was prevalent in 11% of the households (baseline) and in 6% of the households (follow-up year 2). We identified two HFI trajectories—no hunger (73.1%) and marginal hunger (26.9%). Incident anxiety symptoms were reported in 4.5% of the AGYW while incident depressive symptoms were reported in 20%. Another 20% of the AGYW reported low feelings of hope. HFI trajectories were not associated with incident anxiety symptoms [RR:1.13, 95% CI: 0.51, 2.29], incident depressive symptoms [RR: 0.97; 95% CI: 0.71, 1.32] nor hope [RR: 0.98; 95% CI: 0.85, 1.14] in AGYW.

**Implications:** Findings suggest that household hunger reduced over time in Agincourt. However, marginal hunger persisted in some households. Better understanding the factors that promote resiliency of AGYW to HFI may inform the design of interventions to promote mental health in this setting. Studies investigating whether other stressors work in conjunction with HFI to impact adolescent mental health are warranted.
Changes in cardiovascular health among young adults in Healthy Body Health U measured by Life's Essential 8

Background: Establishing ideal cardiovascular health (CVH) in young adulthood, particularly among those with elevated risk factors, may have long-term benefits for morbidity and mortality. The new Life’s Essential 8 (E8) criteria can capture changes in CVH, yet few studies have examined individual-level changes in LE8.

Methods: Longitudinal data from the Healthy Body, Healthy U randomized controlled trial were used to measure E8 at baseline, 6 months, and 18 months (n=459). Participants included young adults (18-35 years) with overweight or obesity enrolled in two northeastern universities. Scores were calculated for each E8 factor and an average of all E8 factors, E8 behavior factors (nutrition, physical activity, sleep, smoking), and E8 health factors (A1C, blood pressure, BMI, cholesterol). Scores ranged from 0 to 100, with <50 considered poor, 50-79 considered intermediate, and 80+ considered ideal CVH. Linear mixed effects models estimated differences in E8 over the 18 months by age, sex, race, recruitment site (as a proxy for SES), and study group, as well as differential longitudinal changes in E8 over time by demographics.

Results: At baseline, nearly all participants were classified as intermediate E8 (85.7%), and few were classified as ideal (9.8%) or poor (4.5%) CVH. E8 average significantly increased at 6 months compared to baseline (beta=1.74, 95% CI: 0.63-2.85) as did E8 nutrition (beta=3.83, 95% CI: 1.60-6.06). E8 blood pressure scores significantly declined at 6 (beta=-22.43, 95% CI: -26.13 - -18.73) and 18 months (beta=-39.06, 95% CI: -44.00 - -34.12). E8 average (beta=-2.33, 95% CI: -4.25 - -0.41) and E8 health (beta=-2.64, 95% CI: -5.03 - -0.25) were consistently lower among those aged 26-35 compared to those 18-25 years, while E8 behavior was consistently lower among those from the lower SES recruitment site (beta=-3.61, 95% CI: -5.81 - -1.42). Females had lower levels of E8 physical activity, but saw greater increases over time compared to males (beta=0.75, 95% CI: 0.07-1.42). Similarly, those recruited from lower SES site had lower E8 A1C but saw significantly greater improvements over time compared to those from the high SES site (beta=0.15, 95% CI: 0.02, 0.28).

Discussion: Identifying how E8 changes over time in young adulthood is important when seeking to optimize CVH and prevent future cardiovascular disease. Understanding differential changes in CVH is necessary to minimizing health disparities by social and demographic characteristics.
Background: Cannabis retailer audits have shown frequent use of promotions and compliance gaps regarding health claims, warnings, and age restrictions. Limited research has examined these practices from consumers’ perspectives or their outcomes.

Methods: Using 2023 survey data among 876 US young adults (ages 18-34) in states with legalized non-medical cannabis reporting past-month cannabis use and past-year cannabis retailer visits, we examined: 1) experiences at cannabis retailers regarding promotions, health claim, warnings (e.g., driving after use), and age restrictions; 2) sociodemographic correlates of retail exposures; and 3) retail exposures in relation to cannabis-related perceptions, use frequency, hazardous use, and driving after use.

Results: In this sample (M_age=27.1, 44% male, 32% sexual minority, 18% Black, 11% Asian, 25% Hispanic), participants used cannabis an average of 14.8 days (past-month; SD=11.2), most commonly flower (53.2%), edibles (21.6%), or vapes (12.6%), and primarily from licensed retailers (57.1%). Most (88.4%) could get to a retailer within 10 minutes (53.0%) or 30 minutes (35.4%). Almost all (85.3%) reported multiple past-year retailer visits (50.6%>6 times; 20.3%>21 times). Using a scale of never, rarely, sometimes, frequently, or always, 20.5% reported frequently/always being offered free product samples and 43.5% price promotions/discounts, and 47.4% noticed promotions/products targeting racial, ethnic, or sexual minorities, college students, or other groups at least sometimes; 61.3% reported exposure to all 3 at least sometimes. Regarding health claims, warnings, and age verifications. 43.4% noticed health claims on product labels/ads, 33.0% signs, and 39.8% from budtenders frequently/always; warnings were seen on labels (51.6%) and signage (43.8%) but rarely heard from budtenders; 81.2% were asked for ID frequently/always. Multivariable analyses indicated 1) greater promotion exposure correlated with being Black; 2) greater health claim exposure: older, female, heterosexual, Black, and less educated; 3) less warning exposure: less education; and 4) less age restriction exposure: younger, male, and Black. Controlling for demographics 1) days used correlated with less health claim and greater age restriction exposure; 2) perceived social acceptability: greater promotion, health claim, and age restriction and less warning exposure; 3) perceived harm: greater promotion and less age restriction exposure; 4) hazardous use: greater promotion and less age restriction exposure; and 5) driving after use: greater promotion and less age restriction exposure.

Conclusion: Certain populations (e.g., racial minorities, less educated) may be exposed to less consumer protections within cannabis retail settings. Furthermore, results underscore the importance of regulations regarding promotions, health claims, warnings, and minor access, and their enforcement.
Driving Change: Assessing Cancer Screening Community Outreach within Wards 7 and 8 of D.C.

Background:

The District of Columbia (D.C.) is divided into wards 1-8. Wards 7 and 8 are located east of the Anacostia River and suffer both the highest incidence and mortality rates of lung and bronchial cancer in D.C. There are several health discrepancies that contribute to limited access to care and resources in these wards, such as poor or complex patient navigation systems. Through diminished knowledge and barriers to screening services, patients in Wards 7 and 8 often receive late diagnoses and thus have poorer prognosis, which is otherwise preventable through early detection and screening education. Our team sought to convey the benefits of early lung cancer screening services in Wards 7 and 8, following a developed framework to increase health literacy.

Methods:

Our team participated in community outreach through an established marketing plan to deliver health information on cancer screening to individuals in both Wards 7 and 8. We were stationed two grocery stores to distribute flyers with specific information on cancer, early detection, and screening services.

Results/Conclusion:

Our reach was estimated to be approximately 80-85 individuals across both grocery stores. It was observed that there was more interaction with the middle-aged and elderly populations. Our team engaged in conversations about connecting community members with screening services through healthcare providers. Through our interactions, we were able to empower individuals to take proactive steps for their health.
Digital, coach-aided psychosocial intervention for young adult cancer survivors

Background: Given the increasing number of young adult cancer survivors and the impacts of cancer on various life domains, interventions addressing the psychosocial needs of young adult survivors are crucial. However, such intervention research is limited, and the existing literature has often: 1) overlooked young adult survivors’ psychosocial needs; 2) targeted depression, anxiety, or fear of recurrence – rather than positive outcomes like well-being; and 3) failed to consider scalable approaches, like digital health.

Purpose of Research: To synthesize and contribute to the literature regarding psychosocial interventions for young adult cancer survivors and catalyze the dissemination of the pending trial’s results.

Methods: This paper documents the development and refinement of an 8-week digital, coach-assisted intervention targeting hope among young adult cancer survivors (ages 18-39, within 3 years of treatment completion) and presents the protocol of the 2-arm RCT (comparing intervention vs. attention control). The intervention builds upon a 2017-2018 pilot trial (n=56); intervention refinements were based on subsequent semi-structured interviews among young adult survivors (n=23).

Results: The pending trial design involves an increased sample size (n=150) to increase power and diversified recruitment efforts (i.e., clinic-based, social media, community-based organizations, etc.) to facilitate intervention reach, accessibility, and scalability. The intervention was enhanced by integrating highly relevant theoretical and therapeutic frameworks, specifically the concept of hope and Acceptance and Commitment Therapy, as well as updating intervention delivery technology. Intervention outcomes include feasibility and acceptability at end-of-treatment and preliminary efficacy on hope (primary outcome) and quality of life measures (secondary outcomes) at end-of-treatment and 16-week follow-up.

Conclusions: This paper may facilitate discussion regarding approaches for addressing the significant psychosocial challenges faced by young adult survivors and catalyze dissemination of trial results.

Implications of findings: This intervention may provide an accessible, scalable way to assist young adults in navigating psychosocial dynamics during their longer-term survivorship journey.
A Qualitative Analysis of the Relationship Between the Perceptions and Experiences of Gender-based Violence (GBV) and Age, Gender, and Country of Origin in the Latine Population in Langley Park, Maryland

**Background:** The Latine population in the United States reached 62.1 million in 2020, which accounts for 19 percent of all Americans and makes it the nation’s second largest racial or ethnic group. In Langley Park, Maryland, 81.5 percent of the community is Latine. Studies show that IPV rates among immigrants can range from 30-60%. The purpose of this study is to analyze interviews focusing on GBV perceptions and experiences of the Latine population in Langley Park, Maryland comparing responses by 1) gender, 2) age, and 3) country of origin differences.

**Methods:** The focal population of this analysis includes adults from Latin America residing in Langley Park, Maryland ages 18-57. A total of 24 interviews were coded for this analysis utilizing the analytical software Dedoose.

**Results:** Research has highlighted the interplay between GBV, gender roles, and the challenges stemming from immigration that contribute to sociocultural norms. The interviews confirmed the hypothesis that gender roles and traditional cultural values can be identified as predictors of GBV among Latine populations and differed by gender and age, but did not tend to differ when comparing origin country, as the cultural values of machismo and familism are prevalent in many Latin American societies.

**Conclusion:** This study is unique in analyzing the perceived causality of GBV through qualitative methods, and examining these factors by age, gender, and country of origin.
Social Determinants of Health and Internalized HIV Stigma Among People Living with HIV in South Florida: An Intersectional Approach

Internalized HIV stigma is associated with several adverse mental and physical health outcomes among people living with HIV (PLWH). PLWH and other marginalized identities may experience worse internalized HIV stigma due to factors related to minority stress and experiences of structural oppression. Thus, this study utilized a multiplicative approach to intersectionality and hierarchical linear regression to examine the associations between intersectional marginalized-group identities and internalized HIV stigma among a sample of PLWH in South Florida (N=1343). Overall, participants reported moderate levels of internalized HIV stigma (M=2.47, range 1-6) with those identifying with marginalized-group age, race, ethnicity, and/or gender experiencing the highest levels of stigma. In traditional regression models, the interaction between gender and ethnic marginalization (b=0.82) and the interaction between age and ethnic marginalization (b=0.32), yielded significantly greater internalized HIV stigma. Additionally, the interaction between age and racial marginalization (b=-0.54) and the interaction between age and sexual orientation marginalization (b=-0.47) were both significantly associated with less internalized HIV stigma among PLWH. Findings highlight the importance of considering the role intersectionality plays in influencing internalized HIV stigma among PLWH and other marginalized identities and offers insight into certain subgroups of PLWH who could benefit from targeted interventions to reduce internalized HIV stigma and improve HIV care outcomes.
How Can We Reduce the Prevalence of Antibiotic Misuse Behaviors? A Health Promotion Program Design

**Background and Significance:** According to the Centers of Disease Control and Prevention (CDC) healthcare professionals prescribed approximately 211.1 million oral antibiotics to outpatients in 2021. Although antibiotics are helpful in the fight against bacterial infections, they can become ineffective from inappropriate use resulting in antibiotic resistance. In the United States, over 2.8 million antibiotic-resistant infections occur each year (CDC, 2022) and over 35,000 people die from antibiotic-resistant bacteria each year (CDC, 2019). Deterring the inappropriate use of antibiotics is essential for public health.

**Program Design:** This four-part health promotion program requires the utilization of family, friends, and healthcare professionals in both in-person and remote or virtual settings to provide support to patients. Component One is an attached pill bottle compliance aid provided with a new prescription. This device is a tactile tracker with at least five switches, with which the individual will "check off" taking their medication for the day. Component Two is a support group for those with active antibiotic use. As these individuals might be immunocompromised or may have a highly contagious infection, the support group will be virtual via a video conferencing platform to prevent additional spread of infection. The support group, which will occur daily for two weeks during a designated time, will consist of at least one group leader (a healthcare professional) and four individuals with active antibiotic use. Component Three is a support telephone or virtual video call line. This support line will be managed by volunteers, healthcare providers, and pharmacists and provide a 24/7 space for individuals to ask general antibiotic-related questions. Component Four is a 24/7 mailbox-type drop-off box for unused antibiotics, which will be placed within hospitals, clinics, pharmacies, and nursing homes.

**Conclusion:** This program aims to ensure that antibiotic users have robust support systems during their active and post-antibiotic course. Furthermore, the program aims to resolve any gaps in education and peer support through tactile aids, support groups, support call lines, and drug disposal drop-offs. Through proper compliance, antibiotic resistance can be reduced, resulting in less complex and severe infections. With less severe infections, the number of infection-related hospitalizations will be reduced.
A qualitative analysis of the clinical experience of survivors of female genital mutilation/cutting (FGM/C) and health care providers

**Background:** At least 200 million girls and women globally and 500,000 in the US have undergone or at risk of FGM/C, a type of gender-based violence. FGM/C can lead to numerous short- and long-term health issues. Health care providers (HCPs) must be equipped to assess and support those at risk for or who have undergone FGM/C.

**Purpose:** To understand the healthcare engagement and experience around FGM/C from the perspective of survivors and HCPs to inform training, support, and resource development.

**Methods:** In-depth interviews were conducted with a purposeful sample (n=25) representing diverse adult survivors of FGM/C and HCPs (n=24) who were living in the US at the time of the study. A qualitative thematic analysis was completed using a list of dominant themes derived from the interview guide. Both deductive and inductive approaches to analysis were employed to capture emerging themes.

**Results/Outcomes:** While discussing health care experiences, when providers recognized the patient had undergone FGM/C, there was a shared survivor-HCP recognition that providers had negative reactions and were unprepared. Themes of overarching biases also emerged. Survivors and HCPs both reported that patients felt shame, stigma, and isolation regarding the experience, and that health care encounters were re-traumatizing in how HCPs handled the interaction. While discussing health care needs, themes centered around improved health outcomes, effective communication, and resources.

**Conclusion:** This study found a need for targeted education efforts on FGM/C for both women and HCPs, more effective communication in the health care setting, and a need for trauma-informed care.

Primary Presenter
Fairuz Mohammed

Status
Doctoral

Authors
Mimi Ismail
Rumaisa Humayun
Ghada Khan
Karen McDonnell

Research Mentor
Karen McDonnell
Disrupting Racism: Reducing Interpersonal Racism Within Medical Subcultures Through Continuous Professional Development

**Background:** Anti-racist practices require conscious, intentional, consistent self-awareness and self-reflection (NMAAHC, 2021). The George Washington University School of Medicine and Health Sciences (GW SMHS) Anti-Racism Coalition was created after George Floyd's death, highlighting the need for more comprehensive anti-racist training in professional settings. Our DISRUPT training offers a novel anti-racist approach by promoting proactive anti-racist community culture. Healthcare departments engaged in anti-racist training as units, further fostering effective interpersonal change.

The goal of the training is to empower medical departments to address their role in contributing to interpersonal anti-racist culture and work to promote health equity. This hybrid training guides individuals to define their role in disrupting racism and promoting anti-racist workplace communities.

**Methods:** This two-step training consists of three virtual modules (n = 338) and an in-person applied training (n = 144). This format increased the material’s accessibility while allowing participants to interact with their peers to deepen their understanding of anti-racist practices. Quantitative participant data was gathered using an online retrospective pre/post-test (Likert scale questions) and an in-person satisfactory-based evaluation.

**Results:** 338 professionals from the GW SMHS completed the modules, and 144 completed the in-person training. The post-test showed that, before the online training, 80% felt motivated to respond to instances of interpersonal racism within their department; upon completion, 94% felt motivated. Before the training, 80% believed it was their responsibility to disrupt racism; after the training, it increased to 93%.

Likewise, after the in-person training, the survey demonstrated a positive impact, as 78% of the same population felt comfortable applying the DISRUPT model to various workplace scenarios.

**Conclusion:** In conclusion, the two-part DISRUPT training successfully motivated professionals to combat interpersonal racism. The online training prompted professionals to acknowledge and accept personal responsibility to disrupt racism; following the completion of the training, healthcare departments felt comfortable combating relational racism within their workplace culture.
Longitudinal Effects of Perceived Immigration Threats on Mental Health and Sleep Problems for Latinx Adolescents

Background & Significance: Anti-immigrant rhetoric and related threats may compromise the health of U.S. Latinx youth. Limited research examines how immigration stressors affect Latinx adolescents’ sleep problems, a critical health outcome. These stressors may harm sleep quality by increasing internalizing symptoms (e.g., depression, anxiety).

Purpose: To examine how immigration-related worries and behavioral change are associated with changes in Latinx adolescent sleep problems directly and indirectly through internalizing symptoms.

Methods: Data derive from youth surveys administered in 2021 (Time 1, T1), 2022 (Time 2, T2), and 2023 (Time 3, T3). The probability sample of 547 Latinx adolescents live in a new immigrant area (55.2% female; Mage = 13.31, SD = .97). Immigration-related worries and behavioral change were assessed as a latent variable at T1 by the 14-item Political Climate Scale (α = .94). Example items are “I worry about family separation” and “I avoid authorities such as the police” (1 = almost never or never to 5 = almost always or always). Sleep problems were assessed at T1, T2, and T3 as a manifest variable using the 13-item Pittsburgh Sleep Quality Index (α = .54-.65). Sleep problems assessed sleep duration, disturbances, quality, and latency (how long it takes to fall asleep). Internalizing symptoms were measured at T1, T2, and T3 as a latent variable by 29 items from the Youth Self Report assessing depression, anxiety, and somatization (α = .94). Analyses were carried out using multiple group longitudinal Structural Equation Models (SEM) by youth gender. Models tested direct and indirect paths from immigration threats to internalizing symptoms to sleep problems for boys and girls. Models assessed across-time and within-time correlations and reciprocal associations between internalizing symptoms and sleep problems. Models controlled for adolescent age and mothers’ education.

Findings & Conclusions: For boys and girls, T1 immigration threats were associated with increases in T2 internalizing symptoms (p < .001) and sleep problems (p < .01). T1 sleep problems were related to increased T2 internalizing symptoms (p < .05), and the converse was true (p < .01). T2 sleep problems were related to increases in T3 internalizing symptoms (p < .001). Marginally significant paths were shown from T2 internalizing symptoms to T3 sleep problems (p = .07-.08). Indirect paths were shown from T1 immigration threats to T2 sleep problems to T3 internalizing symptoms (p < .05).

Implications: Study findings highlight the potential to mitigate Latinx co-occurring adolescent sleep problems and poor mental health by reducing anti-immigrant rhetoric and restrictive policies.
Doctor of Public Health
Easy Access: Identification Verification and Shipping Methods Used by Online Vape Shops

Objective: The "Preventing All Cigarette Trafficking Act" was enacted in 2009 and was amended in 2020. This law requires all online e-cigarette sellers to comply with tobacco laws, including age verification and prohibits the use of the US Postal Service to ship e-cigarettes. In March and April 2021, UPS, FedEx, and DHL voluntarily stopped delivering e-cigarettes. However, online sales still make up about 20-30% of all e-cigarette sales in the US. Studies have shown that over 95% of youth who attempt to purchase e-cigarettes online are successful. This research examines online vape shops' shipping policies and methods (OVS) and describes their age verification process.

Methodology: To identify popular OVS, in January 2023, we conducted three online searches (e.g., "best online vape shops"). Two trained coders searched within the "About Us," "Shipping Policy," and "Frequently Asked Questions" sections and within the home page of each site to identify discrete features. Coders recorded the listed locations of the OVS, along with shipping discounts offered and the shipping carriers listed by each of the OVS. Finally, coders were asked if ID/age verification was required after adding an item to the shopping cart and initiating checkout procedures.

Results: Our search identified 64 unique OVS; of these, 92.2% (n=59) offered to ship products to customers, and 82.8% (n=53) shipped to US buyers. Furthermore, a total of 76.6% (n=49) OVS allowed visitors to type a birthday or choose the "21 or older" (self-certification) option to access the site. Free shipping was offered by 76.3% (n=45) of the 59 sites shipping to buyers, and only 21.9% (n=14) required login to purchase products, while most sites (n=45, 76.3%) allowed visitors to reach the checkout page without any form of ID verification. Lastly, in direct violation of the PACT Act, the US Postal Service is the most commonly used shipping carrier (n=23) amongst the coded OVS.

Conclusions: Our results show that most online vape shops rely on age self-certification, which can be easily bypassed by underage youth to access e-cigarette products. Our findings warrant that federal, state, and local policymakers explore and implement additional regulations for online tobacco sales to address the compliance issues highlighted by our data. These should include provisions for enhanced surveillance, regular compliance checks, and stricter penalties for those violating these regulations.
Nicotine Strength is a Key Driver of E-Cigarette Demand: Evidence from Retail Sales Data

**Background:** Since their launch in the US market, e-cigarettes have undergone multiple changes. One of the most significant changes has been an increase in nicotine strength. From 2013 to 2018, the average nicotine concentration in e-cigarette products sold in the US increased from 2.1% to 4.3%. However, recent sales data for 2022 has shown that products with a nicotine strength as high as 6.8% are now available. This research aims to investigate whether the demand for e-cigarettes varies based on different nicotine strength levels, whether products of different nicotine strengths are substitutes or complements to one another, and whether there are variations in the price elasticities of demand as more products are introduced to the market.

**Methods:** We used Stateline NielsenIQ Retail Scanner Data from 2015-2021 to create four per capita dependent variables. These variables included overall milliliters of e-liquid sold and milliliters of e-liquid sold by nicotine strength for products with less than 3%, between 3% and 5%, and greater than or equal to 5% nicotine concentration. To control for tobacco policies and individual state characteristics, we estimated three-way fixed-effect demand models. We used quarter, year, and state fixed effects to account for unobserved per capita unit sale seasonality, changes in the distribution of per capita unit sales over time, and time-invariant unobserved factors at the state level, respectively.

**Results:** The models indicate that the demand for e-cigarettes is sensitive to price changes, with the price elasticities of demand ranging from -2.117 to -1.494. Among e-cigarettes with different nicotine levels, those with less than 3% nicotine content are the least sensitive to price changes, ranging from -0.536 to -0.575. E-cigarettes containing nicotine between 3% and 5% are more sensitive to price changes, ranging from -0.748 to -0.858. The most sensitive to price changes are e-cigarettes containing 5% or more nicotine, ranging from -1.316 to -1.837. It is possible that products with the highest and lowest nicotine levels are complementary to each other.

**Discussion:** Our study shows that the demand for e-cigarettes varies significantly depending on the nicotine strength. Products with high nicotine content and many substitutes are more responsive to price changes compared to those with lower nicotine concentrations and limited alternatives. The research also suggests that e-cigarettes with the lowest and highest nicotine concentrations may complement each other, leading to concurrent use of products with different nicotine levels. Our findings indicate that policies that affect the price of e-cigarettes, such as excise taxes, can significantly impact the market and may be an effective tool in reducing youth e-cigarette use.
Defining Global Health Diplomacy in a Post-COVID Era: Investigating the Knowledge, Skills, and Core Competencies Required by US Global Health Diplomacy Actors

**Background:** COVID-19 exposed significant gaps in Global Health Diplomacy (GHD) actors' knowledge, skills, and competencies, which hindered their ability to respond effectively to a health crisis of this magnitude. As new COVID-19 variants and other infectious diseases emerge, there is an urgent need to address these gaps to ensure GHD actors are equipped to navigate and respond effectively to future health challenges.

**Research Questions:** The study’s research questions were: **RQ 1:** What skills do GHD actors need for effective GHD practice in a post-COVID era? **RQ 2:** What core competencies do GHD actors need for effective GHD practice in a post-COVID era? **RQ3:** What technical knowledge gaps exist amongst GHD actors? **RQ 4:** How do GHD actors define Global Health Diplomacy in a post-COVID era?

**Methods:** A Grounded Theory and descriptive qualitative design were used to investigate the knowledge, skills, and core competencies required for GHD practice in a post-COVID era. Data was collected using key informant interviews. The study population comprised US-based Core, Multistakeholder, and Informal Global Health Diplomacy actors. A purposive sampling strategy that leveraged criterion sampling and snowball sampling was used to select participants. Twenty-one interviews were conducted: Core (7), Multistakeholder (7), and Informal (7).

**Findings:** To effectively practice GHD or be considered competent, GHD actors must appropriately apply the required knowledge, skills, and abilities at the right place and time. Findings revealed similarities and differences in required knowledge, skills, and competencies within and between GHD actors, indicating that the knowledge, skills, and core competencies requirements for GHD practice are not one-size-fits-all. Therefore, Global Health Diplomacy Training will need to be tailored to meet GHD actors' core competency gaps.

**Research Implications and Significance:** This study proposes a novel conceptual framework systematically developed to be responsive to priority focus areas for Global Health Diplomacy in a post-COVID era. The framework proposes recommendations for strengthening the gaps and inadequacies of the pandemic response and challenges to practicing GHD during this period. It also represents a shift in how GHD actors' capacity can be strengthened in a post-COVID world while concurrently strengthening countries' ability to prevent, detect, and respond to global health threats speedily and comprehensively.

**Conclusion:** Strengthening Global Health Diplomacy requires GHD actors to have the proper knowledge, skills, and core competencies to navigate the intersection of public health and foreign policy priorities to build partnerships that foster a collective approach to address health threats with immediacy and intentionality.
General Public Health
Examining Factors Correlated with COVID-19 Vaccine Hesitancy in Nigeria (2020-2021)

Vaccine hesitancy is a global issue, yet it has mainly been examined through the lens of high income countries. Nigeria has historically struggled with low vaccination rates; as the largest African economy and country, the consequences reach beyond its borders (World Health Organization, 2022). Refusal of the polio vaccine in the northern part of the country fueled outbreaks in three different continents in the early 2000s (Ogundele et al., 2020). A 2022 study indicates that vaccine hesitancy is a persistent problem: Nigeria was above the global average for percent of study sample hesitant about COVID-19 vaccination by about 8 percentage points (Lazarus et al., 2023). Nevertheless, the body of literature on vaccine hesitancy and examining the motivators driving that behavior in Nigeria and other low-income countries remains very limited. Moreover, there is not a lot of data looking at factors driving vaccine acceptancy in Nigeria and other low-income countries. This project seeks to understand what factors appear to be correlated with vaccine hesitancy in Nigeria using data collected by the World Bank as part of the COVID-19 National Longitudinal Phone Survey 2020-2021. This project was inspired to use this data based on a 2023 study examining COVID-19 vaccine hesitancy in 53 low- and middle-income countries (Dayton Eberwein et al., 2023).

The World Bank conducted monthly phone surveys with a core set of households from April 2020 to April 2021 to measure the impact of COVID-19 and restrictions on their socioeconomic status, access to food and needed services, and health. Participants also were periodically surveyed on their attitudes towards prevention strategies such as social distancing and vaccination. I used R to perform descriptive statistics on knowledge, attitudes, and behaviors regarding COVID-19, testing, and vaccination in the sample population from Rounds 1, 6, and 10 of the study. Afterwards, I developed predictive models using the Random Forest library to see what variables had the highest degree of correlation with vaccine hesitancy or acceptance.

The models suggest that zone, state, and other COVID-19 attitudes and behaviors are the top variables associated with vaccine hesitancy. Additional work is needed to determine the statistical significance of these results, but nearly 78% of vaccine hesitant respondents came from the South South, South West, and South East zones.
Qualitative Analysis of Tailored Program Training: Findings From an Antiracist Demonstration Project

Background and Significance: Following the murder of George Floyd, one urban medical center reckoned with its own legacy of racism by setting a goal to become an antiracist institution. After collecting pilot data from two rehabilitation science programs (n=63) within this medical center we found that the two programs were operating on different baseline understandings of racism and the impact of slavery within medicine, therefore illuminating the need for tailored program training.

Purpose: This training is vital for the institution to progress in its anti-racist goal and alleviate the burden of the “minority tax” that continues to prevail for faculty, staff, and students of color in the community.

Methods: Individual interviews (n=6) were conducted with those who completed the initial climate survey to further assess their understanding of and attitudes towards antiracist efforts within medical education. Participants were asked to explain their perceptions of racism, thoughts about their current program’s capacity for antiracism, and their previous personal and professional experiences with antiracism. We began analysis using open coding of the interviews and then narrowed our findings down to 13 different tags illustrating consistent ideas. After each interview was coded we then conducted a thematic analysis of the corresponding data.

Findings and Conclusion: Our analysis found that participants' responses align with the Social-Ecological Model of Health in describing the multifaceted factors that weigh in on the capacity to engage in antiracist efforts. We found 3 codes on the individual level, one being the identified ways in which participants have, without requirement, educated themselves on antiracist efforts. The interpersonal level produced 1 code illustrating how personal relationships have influenced participants' desires to engage in antiracist efforts. We identified 7 codes on the institutional level and further specified those to the program, department, and school level. Institutional level codes illustrate, in one example, perceived challenges to implementing antiracist changes within the department. Finally, 2 codes were categorized as community level with one example being instances in society that invigorated one’s desire to become a part of antiracist efforts.

Implications: Based on mapping the themes to the Social-Ecological Model of Health, we will offer recommendations to the department and individual programs on how to best tailor training that will align with participants' understanding, values, and capacity for change.
Health literacy and information preferences among racial/ethnic minority young adults: Implications for cervical cancer prevention

**Background/Introduction:** Racial/ethnic minorities face disparities in accessing preventive care, including human papillomavirus (HPV) vaccination and Pap testing. Studies indicate that these disparities are linked to upstream inequities in social determinants of health, which negatively impact health literacy (HL) and e-health literacy (eHL) - the ability of individuals to collect and use healthcare information to make informed decisions.

**Purpose:** This study aims to describe the levels of HL and eHL in relation to HPV vaccine and Pap test uptake and explore the current use of health information among racial/ethnic minority young adults (YAs).

**Methods:** A mixed-methods study was conducted to identify digital communication and social media use and preferences for health information among self-identifying minority YAs aged 18 to 40. Survey and interview responses were analyzed using descriptive and thematic approaches.

**Results:** Survey participants (N=228; Mage=26) were predominantly female (83%), non-Hispanic/Latinx (90%), East Asian (56%), and college-educated (74%). Among eligible participants, 65% (N=146) reported ever receiving the HPV vaccine, and 68% of eligible women (N=115) reported ever having a Pap test. Additionally, 60% of participants stated that they searched the Internet for cancer information. Interestingly, individuals who had undergone Pap testing demonstrated similar levels of HL and eHL compared to those who had received the HPV vaccine. Specifically, regarding HL, 86.1% of Pap test participants and 87.7% for HPV vaccine recipients expressed confidence in filling out medical forms. For eHL, 70.4% of Pap test participants and 73.3% of HPV vaccine recipients felt confident in using online health information to make decisions. Similarly, both groups showed a high ability to distinguish between high-quality and low-quality health resources on the Internet, with 80.7% of Pap test participants and 82.8% of HPV vaccine recipients reporting this skill. Interviews (N=16) revealed that YAs primarily accessed health information through the Internet, healthcare providers, and family and friends, preferring reputable online sources over social media.

**Conclusion:** Our findings highlight the importance of providing health education tailored to the literacy levels and communication preferences of racial/ethnic minorities from trustworthy sources to improve preventive care.
The Role of Fibroblast-Derived CCL2 in Early Phase Wound Healing

Skin wound healing is a complex process involving intricate cell interactions. Inflammation is crucial in wound healing, with macrophages being essential mediators. Insufficient or excessive inflammation and macrophage recruitment can hinder proper tissue repair. While tissue-resident immune cells and keratinocytes have long been appreciated for their contribution to the early immune response in the skin, non-immune stromal cells, particularly fibroblasts, are gaining recognition. Our study aimed to elucidate the role of fibroblast-derived CCL2 in injury-induced inflammation and macrophage recruitment during the early phase of wound healing. CCL2 is a small protein chemokine encoded by the Ccl2 gene. Chemokines are signaling molecules involved in immune cell recruitment and activation, essential to inflammation and immune responses. CCL2 specifically functions as a chemoattractant, attracting certain immune cells to sites of inflammation or injury. It primarily attracts monocytes, precursors to macrophages, to the site of tissue damage and contributes to the inflammatory response and tissue repair. Previous data from our lab shows that fibroblasts are an important source of CCL2 at the wound site. Our next step was to verify the function and effects of CCL2 originated in fibroblasts during wound healing.

Using the PdgfraCreER mouse model, we genetically targeted fibroblasts to assess the effects of CCL2 deficiency on immune cell recruitment. Our results demonstrated that fibroblast-derived CCL2 is essential for macrophage recruitment to the wound site during the early inflammatory phase. At the 1.5-day post-wound timepoint, genetic ablation of Ccl2 from fibroblasts significantly reduced macrophage and monocyte numbers, impairing wound healing processes such as re-epithelialization and revascularization. While at the 5-day post timepoint, the macrophage numbers stabilized, however, there were defects in wound repair. Additionally, we concluded that fibroblasts play a critical role in the rapid, early recruitment of innate immune cells to the injured site. Furthermore, the knock-out of CCL2 impairs the healing process. Our findings highlight the importance of fibroblast-derived CCL2 in orchestrating the inflammatory response during wound healing. Targeting this pathway could offer novel therapeutic strategies to enhance tissue repair and mitigate healing complications associated with dysregulated inflammation. Understanding the role of CCL2 produced by fibroblasts is crucial for developing therapeutic interventions to promote efficient tissue repair.
Developing Training Modules for PCPs to Address Systemic Inequities in HIV and COVID-19 Vaccine and Screening Practices

**Background:** Minoritized patients are disproportionately impacted and stigmatized by HIV and COVID-19. The Two in One Model aimed to train primary care practitioners (PCPs) to routinize screening for HIV, PrEP/PEP, and COVID vaccines, alongside providing culturally responsive communication (CRC) to address these disparities in the primary care setting.

The purpose of this project was to train PCPs to address HIV and COVID disparities among minoritized patients through educational training modules.

**Methods:** The Two in One Model includes research, training, and social marketing. The Dimensionality and R4P Health Equity framework, Socio-Ecological Model, Critical Race Theory (CRT), Queer Theory, and Designed-based research theory were applied across our efforts as our overarching conceptual framework. The R4P framework offered the equity-based action required to design a training series, clinician vignettes, and policy white papers to address the historical conditions that cause disparate HIV and COVID outcomes among minoritized populations. The Socio-Ecological Model informed the development of the scoping review on HIV and COVID-19 vaccine practices, while CRT and Queer Theory informed the key informant interviews that were conducted to center the patients’ lived experiences. Lastly, the design-based research approach was utilized when continuously consulting project goals and procedures with our National Advisory Board.

**Results:** The application of the five theoretical frameworks resulted in the development of three white papers and four clinician vignettes that reached 75,000 clinicians as well as a two-part training series: a monthly nine-part live webinar reaching 3,000 learners and a recently debuted asynchronous, self-paced CME-bearing online course. Each online module contains an expert presentation, required readings related to the topic, and supplemental resources including HIV and COVID policy papers and a patient care toolkit. The modules further include a retrospective pre/posttest and commitment to change survey to evaluate PCPs’ knowledge, attitudes, and skills in routinizing, destigmatizing, and engaging in CRC as a part of HIV and COVID-related prevention.

**Significance:** The application of the conceptual framework enabled our two-part PCP training modules and social marketing efforts to tackle historical harm and structural discrimination while integrating CRC into screening practices. Our national research-informed and theory-informed training efforts build the capacity of PCPs to address HIV and COVID disparities among minoritized patients in the primary care setting.
Examining Factors Influencing HCV Linkage-to-Care through the Lens of the Social Cognitive Theory

**Background:** Hepatitis C virus (HCV) infection can greatly impact quality of life if left untreated. Linkage-to-care (LTC) is crucial for effective HCV management. Despite the implementation of various outreach programs, HCV LTC remains suboptimal. The reciprocal determinism principle of the Social Cognitive Theory (SCT) offers valuable insights into evaluating the personal, behavioral, and environmental factors influencing LTC. Using this theory, our study examined factors influencing successful LTC among HCV antibody-positive (HCV+) individuals in Washington DC.

**Methods:** Deidentified data from DC Health’s HCV LTC outreach (2021-2022; n=70) were analyzed. Personal factors (HIV co-infection, mental illness), behavioral factors (opioid use, undisclosed drug use, alcohol use, high-risk sexual activity), and environmental factors (residence in Wards 7 or 8, incarceration, homelessness) were assessed.

**Results:** Among 70 HCV+ individuals, the majority were baby boomers (53%), males (70%), and Black/African Americans (81%). Notably, 89% (n=62) were successfully linked to care. Further analysis revealed that a higher percentage of females (95%) compared to males (86%), as well as individuals born in or after 1965 (n=27) compared to those born before 1965, were linked to care. The LTC rates varied among individuals who disclosed their risk factors (n=40), with rates ranging from 56% to 100%. Specifically, for personal risk factors, LTC rates were 75% for individuals with one personal risk factor and 56% for individuals with two personal risk factors. For behavioral risk factors, rates were 96% and 100% for one and two risk factors, respectively. Likewise, for environmental factors, rates were 72% and 56% for one and two risk factors, respectively.

**Conclusion:** This study highlights HCV risk factors and the impact of reciprocal determinism on LTC. Future programs should consider implementing educational strategies to mitigate the stigma associated with seeking HCV care, fostering collaboration with HIV LTC programs to address the care needs of individuals with multiple chronic conditions, and providing supplementary services such as opioid substitution treatment, mental health counseling, and transportation assistance, particularly for patients residing in areas with limited access to healthcare facilities.
An Approach to Applying an Intersectional Lens to Black Women’s Reproductive and Sexual Health

**Background:** While the concept of intersectionality is not new, its interpretation and translation across research remains inconsistent. Often intersectionality is used as a theoretical framework useful for explaining study findings without applying it as a lens to the study design or how data is collected (Bowleg, 2012). These oversights contribute to how the complex sexualities of Black women get flattened and how structural barriers to reproductive health remain overlooked (Prather et al., 2018).

**Significance:** Given that research informs policy and practice, it is important that intersectional approaches to Black women’s reproductive and sexual health research are more robustly interrogated and uniformly understood.

**Methods:** We used key words to perform a Boolean search of 12 open access peer-reviewed articles published on Black women’s reproductive and sexual health in the last five years. Using the Silences Framework (Serrant, 2020), we assessed how each research study operationalized and integrated this concept into its research question/s, study design, discussion of findings and practice or policy implications.

**Results:** By identifying themes that cut across how researchers define and apply the concept of intersectionality, we offer recommendations that better capture the richness of, and ongoing threats to, Black women’s reproductive and sexual wellness.

**Conclusion:** The intersections of race, class and gender in research, policy, and practice serve as sites of oppression and strength in the analysis of Black women’s health. Reframing how we talk, research and write about the reproductive health and sexuality of Black women is necessary to advance health equity.
Analysis of putative fexinidazole survival gene identified from a forward genetics approach.

**Background:** Human African Trypanosomiasis (HAT) is a neglected disease of poverty that impacts nearly 65 million people in Sub-Saharan Africa and its prognosis is fatal if not treated. HAT treatment is burdened with limited therapeutic options and emerging drug resistance. Development of fexinidazole as an oral monotherapy recently revolutionized the treatment plan for African trypanosomiasis because of its streamlined administration. Fexinidazole is a nitroaromatic drug predicted to cause DNA damage through ROS stress resulting in trypanocidal activity; however, the exact mechanism of action has not been demonstrated. In addition, there is a rising concern that multidrug resistance, which has been observed in the laboratory, may emerge against nitroaromatic drugs in the field.

**Methods:** Evaluating potential sources of drug resistance is necessary for the continued safe usage of this clinically relevant drug. In order to analyze how trypanosomatid drug resistance arises, the Hovel-Miner lab utilized their novel *Trypanosoma brucei* inducible gene expression library to identify genes that promote survival in the presence of fexinidazole. One gene from the genetic screen, *Tb927.11.10590*, was selected for further studies. This gene encodes a putative Glutathione-S-Transferase C terminal domain (TbGST-C) containing protein (TriTrypDB.org). Glutathione S-transferase (GST) proteins are widely distributed in prokaryotic and eukaryotic cells, where they act as endogenous and exogenous detoxifying isoenzymes. Locating to the cytoplasm, mitochondria and microsomal fractions, GST proteins are linked to drug resistance. TrypTag database reported that that C-terminally mNeonGreen tagged TbGST-C locates to the mitochondria of *T. brucei* procyclic cells, while the N-terminally tagged version presents a weak cytoplasmic and endosomal localization. This dual localization is being addressed by alternate tagging in the bloodstream form of *T. brucei*.

**Results:** RNAi high-throughput screens suggest this protein is not essential. However, as shown here, overexpression of TbGST-C was associated with fexinidazole resistance and cross-resistance to nifurtimox, increasing their EC$_{50}$, but not benznidazole. Therefore, our results show that TbGST-C may constitute a significant gene involved in the mechanism of action of fexinidazole that merits further investigations.

**Conclusion:** This research is significant because fexinidazole is emerging as a critical tool in the treatment of trypanosomiases and a more nuanced mechanistic understanding is needed to stave off future drug resistance.
Exploring Cervical Cancer Prevention Knowledge and Awareness among Women Living with HIV in the DC Metropolitan Region

Background/Introduction: Cervical cancer is a significant global health issue despite preventive measures like human papillomavirus (HPV) and Pap testing, as well as HPV vaccination. Women living with HIV (WLH) face higher risks due to increased susceptibility to HPV infection and lower utilization of screening services.

Purpose: This study aims to enhance understanding of cervical cancer and HPV preventive measures among WLH in the DC metropolitan region. Additionally, it seeks to identify strategies to improve awareness of preventive care and increase participation in cervical cancer screenings within this population.

Methods: During the formative phase of the MYSHARE study, focused on cervical cancer prevention among WLH, survey data were collected from 2020 to 2021 via REDCap, phone, or mail. Participants were WLH aged 21+ residing in the DC metropolitan region. Descriptive analyses were conducted to elucidate psychosocial factors, beliefs, and perceptions influencing screening behaviors.

Results: Among 81 WLH surveyed, 95.1% reported prior Pap testing, with 92.6% recognizing regular Pap tests as essential for cervical cancer prevention. However, only 73.8% were aware of the recommended annual frequency for Pap testing, and merely 22.2% knew the appropriate age to initiate screening at 21 years old. Knowledge gaps were evident regarding risk factors for cervical cancer and HPV, particularly concerning smoking (17.3%), early sexual activity (30.9%), and irregular Pap testing (35.8%). Moreover, only 42% of WLH were aware of the protective benefits of the HPV vaccine.

Conclusion: While WLH in the DC metropolitan region demonstrated a general understanding of Pap testing, disparities in knowledge were observed regarding screening frequency and initiation age. Additionally, awareness of cervical cancer and HPV risk factors was low compared to Pap testing awareness. Future educational efforts should prioritize informing WLH about these risk factors and emphasizing the HPV-cancer relationship to address knowledge gaps effectively.

Primary Presenter
Jasmine Valencia

Co-Presenter(s)
Clarke Gilmore

Status
Undergraduate

Authors
Jasmine Valencia
Clarke Gilmore
Annie Ciceron
Daisy Le

Research Mentor/Department Chair
Daisy Le
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Judges

Laura Abate, MSLS
Lorien Abroms, ScD, MA
Attiya Ahmad, PhD, MA
Matthew Barberio, PhD, MS
Alberto Bosque-Pardo, PhD, MBA
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James Chung, MS
Brian Coblitz, PhD
David Diemert, MD, FRCP(C)
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Margaret Ulfers, PhD
Chelsea Ullman, PhD
Anushree Vichare, PhD, MPH, MBBS
John W. Warren, MS
Erica Cusi Wortham, PhD

Staff & Collaborators

Ogechi Abeduo, MBA, MFin
Cynthia Alame
William Atkins
Rachel Burley
Rishell Chambers
Theresa Chapman, CRA
Robin A. Delk
Stacey DiLorenzo
Rayshawn Douglas
Ariana Etemad
Naman Gupta
Ben Horn
Imomotimi (Timmy) Imomotebegha, MSc, MS
Purvi Jain
Bijan Manavizadeh
Bridget Martin
Drew Moger, MFA
Dayna de Montagnac
Paul Ndebele, PhD
Sumaiya Nezam
Valerie Obisesan
Sara Park
Reese Rackets
Laura Rogers
Adam Stuhltrager
Tien-Chin (Jeff) Wu, MPH
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**Mentors**

Lorien Abroms, ScD, MA  
Susan Anenberg, PhD, MS  
Matthew Barberio, PhD, MS  
Carla J. Berg, PhD, MBA, LP  
Robert A. Canales, PhD  
Amanda D. Castel, MD, MPH  
Uriyoan Colon-Ramos, ScD, MPA  
Patrick Corr, EdD, MEd  
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Sameera A. Talegawkar, PhD  
Amy Tsurumi, PhD  
Rob van Dam, PhD  
Amanda J. Visek, PhD  
Amita Vyas, PhD  
Maranda Ward, EdD, MPH
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