Research Statement

I am a PhD candidate in the School of Public Health at the University of Nevada Las Vegas (UNLV). I have focused my work on global and environmental health research, with special interests in the epidemiology of the human immunodeficiency virus (HIV), obesity, and air quality. My research statement is in two parts; the first part is about my work on air quality, while the second part is about my work on HIV and obesity.

Air Quality
Current Work
As a student researcher, I have studied the impact of public transit buses on air quality in the United States. Public transit buses, which move more than 5 billion passengers annually in the U.S., can contribute substantially to the environmental health burden through emitted air pollutants. Despite the improvements in transit buses' use of cleaner fuel, they still contribute to air pollution. Air pollution due to all on-road vehicles in the U.S. had been estimated to cause about 15,000 premature deaths annually, but those due to transit buses are unknown. Using the CO-Benefits Risk Assessment (COBRA) tool developed by the Environmental Protection Agency (EPA), our study estimated that 1–3% of traffic-pollution-related premature deaths in the U.S. (15,000 per year) may be attributed to transit buses. A transition of these buses from diesel and gasoline to cleaner fuels like natural gas will yield long term health and economic benefits for the United States.

Future Work
As a follow up to the air quality study, I propose to assess the impact of transitioning all the school buses (Yellow buses) to cleaner fuels, both in Clark County, Nevada, and nationally. There are about 500,000 of these buses in the US and they transport close to 24 million students every school day. Latest figures show that about 80% - 90% of these buses are still powered by diesel or gasoline. My study will look at how the use of cleaner fuels for these buses will impact the air quality both locally, and nationally.

HIV and Obesity
Current Work
For my PhD dissertation, I am exploring the intersection between HIV and obesity. In the western world (the United States, for example), several researchers have documented that the prevalence of obesity and overweight among HIV positive clients is rising, and nearly approximates that of the general population. This trend is alarming. Since HIV is an infectious disease, that causes a chronic inflammation of the bodily organs, overweight or obese HIV clients are burdened with a double epidemic leading to further health disparities. For my research, I will be studying the prevalence and trends of obesity among people living with HIV (PLHIV) in Africa (using Nigeria as a case study). I will be using an explanatory sequential mixed methods approach to further understand this emergent phenomenon. My research will include a quantitative and a qualitative aspect, with significant integration of the two parts during the development of the qualitative questions and at the end of the research. It is my expectation that at least two peer reviewed publications and three conference abstracts/presentations will result from this research. I intend to use the results of my study (both the quantitative and the qualitative) as preliminary data for application to the National Institutes of Health (NIH) for an R03 funding as a post-doc or assistant professor.

Future Work
As a follow up to my dissertation, I intend to design a mixed method study on body mass index (BMI) changes among PLHIV on treatment that will help address some of the limitations identified from my initial study. The new study will collect data on diet and exercise at baseline and at every visit. Additionally, it will be a prospective study, hence we should have cleaner data. This study is proposed as my first grant application to be submitted to NIH during my post-doc or as an assistant professor.

Statement On Research Activity Experience

In 2018, I got a summer job in the Urban Air Quality Laboratory at UNLV. It was a great experience working in this lab under Dr L.-W. Chen. After he explained the research project I would be working on for the summer, I was extremely excited because it tied very closely to a term paper I had written for my environmental health class.

My research was about the impact of transitioning diesel- and gasoline-powered buses to cleaner fuels like natural gas. The Regional Transport Commission of Southern Nevada (RTC) had been switching all their old buses from diesel and gasoline to natural gas since 2007. Whenever any bus reaches its end of life – defined as 12 years of service or 500,000 miles – it was retired and replaced. Such that as at 2017, 75% of their bus fleet was powered by natural gas. I studied the effects of this policy change on the air quality in Clark County, Nevada, and on a national scale, assuming this policy was adopted by all 50 states in the United States. We used the Co-Benefits Risk Assessment tool (COBRA), that was developed by the Environmental protection Agency (EPA), to model the health benefits of this policy change in terms of deaths, heart diseases, respiratory diseases, and days of lost work, for Clark County, and then for the entire United States.

Our findings showed that if all the RTC diesel buses are transitioned, there will be a total health benefit between 2 - 10 million dollars annually from the prevention of heart and lung diseases, and days of lost work avoided. It will also prevent about 15 asthma attacks annually. However, if this transition is effected across all 50 states in the US, it will potentially prevent about 400 adult deaths, and another 5,600 asthma attacks in children. Additionally, this change can help avoid 26,000 days of lost productivity. The potential total health benefit from this switch (nationally) is between 1.6 - 4.1 billion dollars. Our findings are important because it provides further evidence for policy makers to possibly accelerate the change towards cleaner fuels for the public transportation system. This kind of impact will reduce deaths, heart attacks, and asthma attacks with consequent economic savings for the US in the long term.

Though this research showed significant results, it started very slowly at first. There were significant challenges with requesting and retrieving data from the RTC and the air quality unit in Clark County. Additionally, some of the data we needed to develop our model was not publicly available. For example, the National Emissions Inventory (NEI) data that was collected in 2017 was not yet in the public domain. These issues pushed us to develop alternate methodologies for our air quality models. By fall 2018, we had completed our air quality models and run them through the COBRA tool. The outputs were then interpreted and discussed with the research team. Finally, the results of this research was disseminated at the Rebel Grad Slam, the Graduate Student Research Forum, and published in a peer reviewed journal.

In conclusion, this research and the experience of participating in the Graduate College Research Certificate (GCRC) program have proven to be of immense benefit. First, the research provided me with a deeper understanding of air quality models and data sources for future research. Second, I got a peer reviewed publication from the research, for which I was the first author. Finally, the year-round GCRC workshops were very timely in providing career guidance, data sources, and introduction to new data analytical software. Overall, I would recommend the GCRC program to graduate students who are interested in expanding their research capacity.